Products finishing

CLEANING
PLATING
POLISHING
FINISHING

FEBRUARY 1952

Saving Nickel

Lea Copper-Glo

Something New in Bright High Speed Copper Plating

The Ronal Bright Copper Process* using Lea Copper-Glo is the answer to the platers' prayers because it answers the problem of extreme nickel shortages.

Lea Copper-Glo makes it practicable to plate properly prefinished steel and die-castings *directly* with chromium without any intermediate buffing operation. It makes it possible for you to forget your nickel worries.

The user of Lea Copper-Glo enjoys numerous advantages as for example:

OPERATING

- Brilliant ductile deposits
- High current density with 100% efficiency
- Exceptional throwing power
- No wetting agents required
- Direct, interrupted or periodic reverse current

COST SAVINGS

- Reduces tank plating time due to high speed operation. (Hull cell bright current density range 10-60 amp./ft.^{2})
- Reduces rejects whether followed by bright nickel or otherwise; since it contains no wetting agents
- Reduces brightener costs to a few cents/100 gallons of plating solution per day

The Ronal Bright Copper Process using Lea Copper-Glo can be fitted into your plant operating cycle. Regular cyanide or Rochelle Copper baths can be readily converted to obtain these advantages. Write for further information.

Ronal Bright Copper Process is a development of Ronal Chemicals, Brooklyn, New York, for which process patents are pending.

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

THE LEA MANUFACTURING CO.
16 Cherry Avenue, Waterbury 20, Conn.

LEA MFG. COMPANY OF CANADA, LTD.
370 Victoria Street, Toronto 2, Canada

Oakite's New FREE Booklet on Paint Stripping

WHAT'S THE BEST WAY TO STRIP PAINT FROM METAL PARTS TOO LARGE TO BE SOAKED IN TANKS?

See Page 3

answers many questions that will lead you to better stripping procedures. You'll want to read more about:

What's the best way to strip large areas of structural metal where a steam supply is available? ***See page 5.***

What is the best method when steam is not available? *See page 7.*

What is the cheapest way to strip metal parts in large volume? ***See page 9.***

What are the best ways to prepare stripped surfaces for repainting? *See page 11.*

What strippers are best for removing oil-base paints?... Synthetic enamels, alkali-resistant plastics or resin-based paints?... Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? ***See page 12.***

FREE For a copy of "How to STRIP PAINT" write to Oakite Products, Inc., 20 Thames St., New York 6, N. Y.

Machine cleaning	**Tank cleaning**	**Electrocleaning**
Pre-paint treatment	**Pickling**	**Barrel cleaning**
Steam-gun cleaning	**Burnishing**	**Rust prevention**

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SPECIALIZED INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE

55 PAGES OF FACTS ON HOW TO CUT YOUR SMALL PARTS FINISHING COSTS

Now you can get up-to-the-minute news on the very latest developments in barrel-finishing — the fast, modern, economical process that deburrs, removes scale, tool marks and flash, and produces surface finishes and radii to blueprint specifications.

Norton Company's brand new booklet covers the subject thoroughly in 55 liberally illustrated, fact-filled pages — describes in detail every phase of barrel-finishing — tells you what to do, *and what not to do*, for best results.

PARTIAL LIST OF SUBJECTS

TYPES OF EQUIPMENT . . . CLEANERS . . . ROUGHING . . . RUST PREVENTIVES . . . FINISHING . . . PROCESSING OF SAMPLES . . . SEPARATION OF WORK FROM ABRASIVE . . . WASHING . . . DRYING . . . RESCREENING OF ABRASIVE . . . MIXING DIFFERENT PARTS.

GET THIS MONEY-SAVING INFORMATION

The new booklet also tells you how Norton ALUNDUM* tumbling abrasive — especially developed to meet industry's wartime needs for fast, efficient small parts finishing — has become a standard barrel-finishing medium in plants throughout the country.

Learn how this tough, hard abrasive helps you to shorten tumbling cycles, reduce scrap and reworking, and gives you consistently better finishing of parts ranging in size from tiny rivets to larger castings. Ask your Norton distributor or representative for your free copy of "Barrel-Finishing With ALUNDUM Tumbling Abrasive," or write us direct.

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. . . ability to provide complete equipment and materials for every plating and polishing need
. . . the complete background of knowledge and experience in every aspect of plating and polishing

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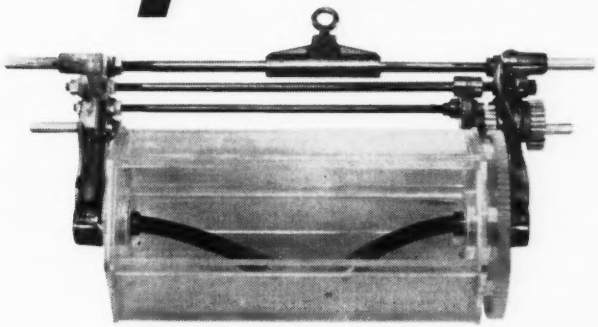
- . . . **Availability in a variety of materials—Plexiglas, Merlon, Bakelite, hard rubber, depending upon the service**
- . . . **Smooth functioning under continuous production**
- . . . **Availability of cylinders in a variety of sizes and perforations with a wide choice of contacts**
- . . . **Tripple-tie-rod-hanger construction**



The wide variety of materials, sizes and contacts in which H-VW-M Plating barrels are supplied enables the user to select the exact type best suited to his needs. For example, Plexiglas cylinders with flexible danglers are recommended for operation through the entire cycle, acid or alkaline. Where increased production is the deciding factor, Merlon Ribless construction is supplied. If desired, barrels with pumping equipment are available to assure constant solution balance, thereby reducing the plating time.

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Naturally, we at Egyptian are primarily interested in the product finishing system you adopt this year . . . but let's view the picture from your side of the desk. Let's consider not only *how* your product will be finished but also *where* will your product finish on the sales and production charts at the year's end.

If you manufacture for the civilian market, it is imperative that the Finishing Formulae you develop be the most outstanding in its field . . . Here Egyptian Research Laboratories can help keep that elusive sales curve on the rise.

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(On leave of absence
U. S. Air Force)

Products finishing

FEBRUARY 1952
VOLUME 14 • NUMBER 5

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Associate Editor

H. LEROY BEAVER
ALLEN G. GRAY
BRYANT W. POCOCK
Consulting and Contributing Editors

GENE J. SCHWARBER
Advertising Manager

NORMAN S. ROGERS
Art Director

L. V. SONENSCHEIN
Circulation Manager

ADVERTISING REPRESENTATIVES

RICHARD S. KLINE
GEORGE E. HAY
431 Main St., Cincinnati 2
MAin 0182

G. M. FILLMORE
DUNCAN W. BARTON
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THE ROBERT W. WALKER CO.
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3 way help

on all finishing problems

1 Technical help on FINISHING METHODS

Do you spray, dip, flow-coat or all three? Sherwin-Williams' wide background of experience in all types of production finishing methods—including electrostatic, automatic and hot spray—may help you solve production problems, whether defense or civilian.

2 Specialized help on FINISHING MATERIALS

Sherwin-Williams Industrial Production Line Finishes include a complete line of primers, reducers and finish coats for air drying and baking, for wood and metal, especially designed to meet civilian production-line requirements.

3 Industry-wide experience on FINISHING DEVELOPMENTS

Sherwin-Williams' broad experience in finishes and finishing systems for all types of products provides every industry the benefit of improvements in materials and techniques developed in other specialized fields.

DEFENSE FINISHES *must fit* BOTH!

Producing finishes that fit government specifications for defense products is only half the job. Unless they fit the practical needs of finishing line operation, too, they can impose undue restrictions on output, efficiency, or both.

Sherwin-Williams experience, extending through both World Wars, together with technical service facilities extending from coast to coast, provides the broadest possible background for meeting *both* requirements in the production of specification finishes.

If you have a problem of adapting or devoting any portion of your production to defense contracts involving the use of finishes, your Sherwin-Williams Industrial Finishes Specialist can offer you valuable help. Call on him today, or write The Sherwin-Williams Co., General Industrial Division, Cleveland 1, Ohio. Industrial Zone Offices located in Philadelphia, Pa., Newark, N. J., Chicago, Ill., Cleveland, Ohio, Grand Rapids, Mich., Atlanta, Ga., Dallas, Texas, and Oakland, Calif.

SHERWIN-WILLIAMS

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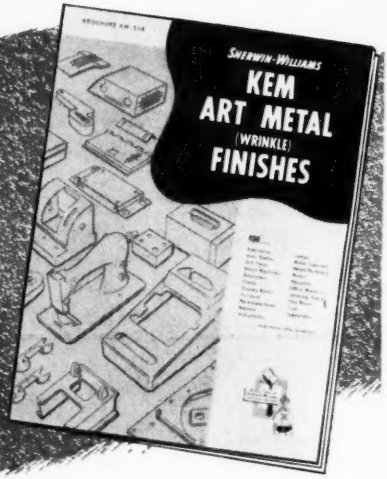
for defense production . . . for civilian production

NEW WRINKLES

for adding sales appeal to

OLD PRODUCTS

(and new ones, too!)

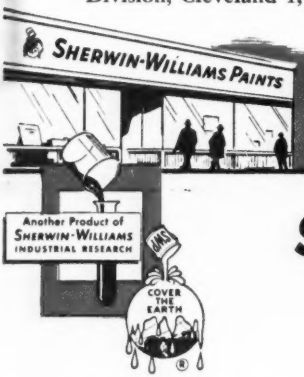


It may cost LESS to give your product the glamour . . . distinctiveness . . . sales appeal . . . of this rich Sherwin-Williams textured finish, than to use conventional metal finishes!

Kem Art Metal (wrinkle) Finishes are economical because they cover with one coat . . . conceal minor surface imperfections and blemishes . . . often eliminate need of extra operations to remove weld marks, etc. They relieve the monotony of large, plain surfaces . . . add interest and eye appeal to any metal product.

Kem Art Metal Finishes—described in this new Sherwin-Williams Brochure AM-514—are part of the complete line of Sherwin-Williams quality finishes especially designed to meet production line requirements and stocked at your nearby local Sherwin-Williams Branch.

Consult your classified telephone directory—check this handy local source for your industrial product finish needs—ask or write for copy of this brochure. The Sherwin-Williams Co., General Industrial Division, Cleveland 1, Ohio.



Your "on-the-spot" source for
PRODUCT FINISHES

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Give your Metal a Beauty Bath

WITH

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Save Time and Equipment with the Brand New KLEM-KOTE 3-STEP Cleaning and Conditioning Process

Klem-Kote is the newest development in the field of metal preparation and rust-proofing. Used in a three-stage washer system it will give paint adhesion and salt spray resistance equal to or better than complex five and six stage rust-proofing systems.

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City_____ State_____

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means Easier going

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For Fast Polishing in All Types of Metal Finishing

For smooth surfaces of moldboard plows and for any tool or equipment where smoothness means more effective work, EXOLON Aluminum Oxide Abrasives assure fast, uniform metal finishing. These chunky, durable grains are magnetically separated, carefully graded and shaped for polishing all types of tough metals, including spring steel, sheet metal, cold rolled stock, forgings and stainless steel. Ceramically coated for strong adhesion to the set-up wheel, EXOLON RST is the ultimate choice for efficient polishing.

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Exterior view of water wash spray booth.
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Air make-up intake filters at rear of water wash spray booth.
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AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet

Subject: METAL PRESERVATION AND PAINT PROTECTION WITH ACP PHOSPHATE COATING CHEMICALS

Ordnance products are now given a protective phosphate coating for extra durability under all kinds of severe exposure conditions. Both military and civilian applications of ACP phosphate coating chemicals are shown in the chart below.

SELECTION CHART OF ACP PROTECTIVE COATING CHEMICALS FOR STEEL, ZINC, AND ALUMINUM

METAL	ACP CHEMICAL	OBJECT OF COATING	TYPICAL METAL PRODUCTS TREATED	GOVERNMENT SPECIFICATIONS
STEEL	"GRANODINE" Zinc Phosphate Coating Chemical	Improved paint adhesion	Steel, iron, or zinc fabricated units or components, automobile bodies, refrigerators, washing machines, cabinets, etc.; projectiles, rockets, bombs, rifles, small arms, belt links, cartridge tanks, vehicular sheet metal, tank bolts and links, recoilless guns, etc.	MIL-S-5002 JAN-C-490, Grade 1 JAN-F-495 U.S.A. 57-0-2, Type II, Class C U.S.A. 51-70-1, Finish 22.02, Class C U.S.A. 50-60-1 16 E4 (Ships)
	"PERMADINE" Zinc Phosphate Coating Chemical	Rust and corrosion prevention	Nuts, bolts, screws, hardware items, tools, guns, cartridge clips, fire control instruments, metallic belt links, steel aircraft parts, certain steel projectiles and many other components.	MIL-C-16232 U.S.A. 57-0-2, Type II, Class B U.S.A. 51-70-1, Finish 22.02, Class B Navy Aeronautical M-364 U.S.A. 72-53 (See An-F-20)
	"THERMOIL-GRANODINE" Manganese-iron Phosphate Coating	Wear-resistance anti-galling, safe break-in of friction or rubbing parts. Rust proofing.	Friction surfaces such as pistons, piston rings, gears, cylinder liners, camshafts, tappets, crankshafts, rocker arms, etc. Small arms, weapon components. Hardware items, etc.	MIL-C-16232 U.S.A. 57-0-2, Type II, Class A U.S.A. 51-70-1, Finish 22.02 Class A Navy Aeronautical M-364 U.S.A. 72-53 (See AN-F-20)
	"GRANODRAW" Zinc-iron Phosphate Coating	Improved drawing, extrusion, and cold forming	Blanks and shells for cold forming, heavy stampings; tubs; tubing for forming or drawing; wire; rod; etc.	———
ALUMINUM	"ALODINE" Protective Coating	Improved paint adhesion and corrosion resistance	Aluminum products of similar design such as refrigerator parts, wall tile, signs, washing machine tubs, etc; aircraft and aircraft parts; bazookas (rocket launchers), helmets, belt buckles, clothes dryers, clothesline, rocket motors, etc., aluminum strip or sheet stock.	MIL-C-5541 (See also QPL-5541-1) MIL-S-5002 AN-F-20 U.S. Navord O.S. 675 16 E4 (Ships) AN-C-170 (See MIL-C-5541) U.S.A. 72-53 (See AN-F-20)
ZINC	"LITHOFORM" Zinc Phosphate Coating Chemical	Improved paint adhesion	Zinc alloy die castings; zinc or cadmium plated sheet or components; hot dip galvanized stock, galvanneal; signs; siding; roofing; galvanized truck bodies; etc.	QQ-P-416 RR-C-82 JAN-F-495 AN-F-20 U.S.N. Appendix 6 U.S.A. 72-53 (See AN-F-20)

CHEMICALS ACP PROCESSES

WRITE FOR DESCRIPTIVE FOLDERS ON THE ABOVE CHEMICALS AND FOR INFORMATION ON YOUR OWN METAL PROTECTION PROBLEMS

CHEMICALS ACP PROCESSES

always better . . . better all ways . . .

New

COPPER FLAT-TOP

✓ better than ball anodes

● **Flat-Top,** the premium copper anode at a popular price, is SMOOTH! No gates or flash to hang on basket.

● **Flat-Top** has Greater Area. From 20 to 25% more effective area than the ordinary ball. More metal, less frequent loading.

● **Flat-Top** is Pure. No cavities to hide inclusions of copper oxide, silica or dirt. Manufactured from highest purity copper.

✓ better than oval anodes

● **Flat-Top** is "Good to the last molecule!" No waste, no annoying scrapping of "swords" and hooks. 100% efficiency.

● **Flat-Top** is Predictable! Eliminates rapidly changing anode area as ovals corrode, decreasing sludge formation and rough plating.

● **Flat-Top** is Ready! No delay, no extra costs of fabricating and attaching hooks. Load your tanks right from the keg.

✓ and copper Flat-Top is . . .

● **CLEAN!** Packed in new durable wooden kegs, protected from contamination of battered, used drums.

● **CONVENIENT!** Keg is safe to stack, easy to roll or truck. And all these **PREMIUM FEATURES** with substantial savings for you!

Ask for your copy of the Copper Flat-Top Folder. Call the nearest Wagner Branch listed below or write for the name of our representative in your area, if the branch location is not convenient. Wagner Brothers polishing and plating equipment and materials are available in all industrial centers.

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ALL METAL
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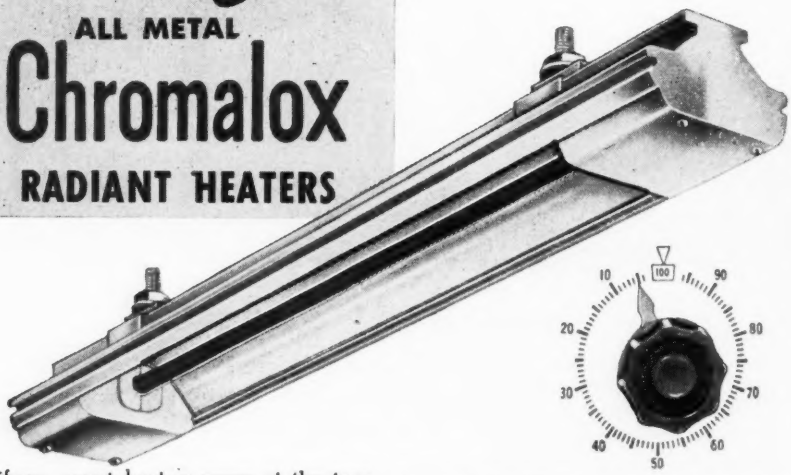

Uniform, exact heat is yours at the turn of the dial with Chromalox Electric Radiant Heaters. Quickly installed, Chromalox Units operate efficiently in low and high ambient temperatures; provide glareless radiation in infrared wave lengths absorbed efficiently by all colors, textures and surfaces. All-metal construction withstands shock, vibration, dust, moisture and eliminates contamination hazard.

Finger-tip control assures consistent and exact operating temperatures for varying needs. Various zones of heat within the same oven are possible by setting up separate controls for each bank of units.

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- BAKING PLASTICS
- SEALING
- DRYING GRANULAR PLASTICS
- DEHYDRATING
- MOLD DRYING
- CURING LATEX AND PLASTICS

and many other applications

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IC-52

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Electric heat for modern industry

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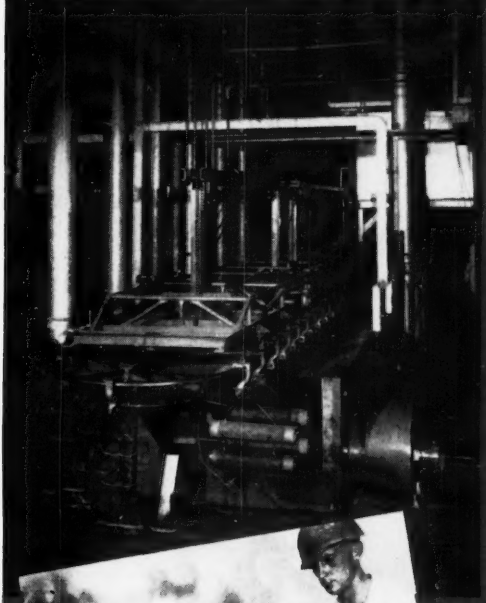

One of the newest infantry weapons is the recoilless rifle, which has no kickback. Gas pressure escapes through shell casing perforations.

UDYLITE EQUIPMENT
PROCESSES SHELL CASINGS FOR ARMY'S RECOILLESS RIFLES

This Udylite installation, at Servel, Inc., Evansville, Indiana, is used in manufacturing shell casings for the Infantry's new portable artillery. Because of heat and pressure, shell casings must have a tough, durable finish . . . and Udylite's engineering "know-how" provided a unit that meets this exacting requirement with all possible efficiency. Casings are cleaned, pickled and bonderized, prior to lacquering, *automatically* —in one operation. The savings, in time, money and manpower, are obvious.

Udylite machines, methods and materials provide a faster, *better way* in *plating*, anodizing, blackening, cleaning, pickling or processing of any nature. Talk it over today with your nearby Udylite Technical Man. There's no obligation.

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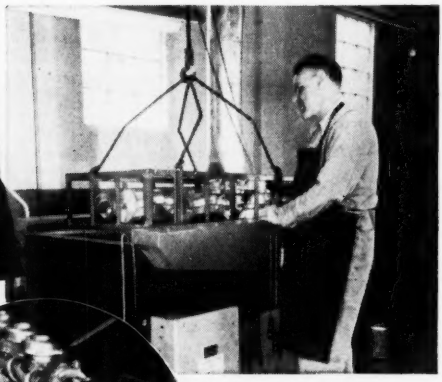
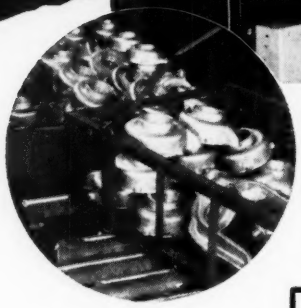
DETROIT 11, MICHIGAN

ENGINEERED MP SERVICE

PHILLIPS

POWER TOOL MANUFACTURER CLEANS CASTINGS, STAMPINGS, MACHINED PARTS, FASTER AND MORE THOROUGHLY WITH A PHILLIPS DEGREASER





Skilsaw reports improved cleaning before painting and assembly.

Above: **Metal parts are thoroughly cleaned in Phillips high efficiency Model 60 degreaser. Inset shows condition of parts *after* degreasing.**

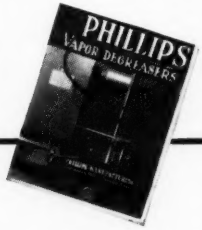
HERE is another case illustrating the high cleaning efficiency of Phillips degreasers. Skilsaw, Inc., Chicago, uses a Phillips Model 60 electric batch-type machine to clean both aluminum and iron castings, steel stampings, shafts and screw machine parts. These parts must be thoroughly cleaned before painting and assembly of the finished product. Among the types of soil removed are coolants, kerosene, drawing oils, and just plain shop dirt.

Skilsaw reports that the Phillips unit cleans their parts better, as well as 3 to 4 times faster than their former method. Thus production is speeded up and better control is assured over the quality of the finished product.

Check into the time and money you can save with Phillips Vapor Degreasing. Our representative will be glad to discuss your parts cleaning problem with you.

SEND FOR YOUR COPY OF THIS NEW BULLETIN

Describes and illustrates Phillips engineered metal cleaning equipment.



Phillips

3457 TOUHY AVENUE • CHICAGO 45, ILLINOIS

MANUFACTURING COMPANY

ENGINEERED METAL CLEANING EQUIPMENT

Armour Backstand Belts do the job right

Toledo Steel Tube Co. saves time

2 hours per operation per day—that's the time the Toledo Tube Co. saved by switching to backstand belts. In removing burrs and grip marks from tubing, they found Armour Coated Abrasives cut faster, last longer, give a better finish.

Armour has one of the most modern plants in the coated abrasives industry. Belts are only one of the many forms of coated abrasives available to you — more than 30,000 different varieties in grip size, backing, etc. Sheets, rolls, discs, tubes — and specialty sizes to meet your specifications, if you need them.

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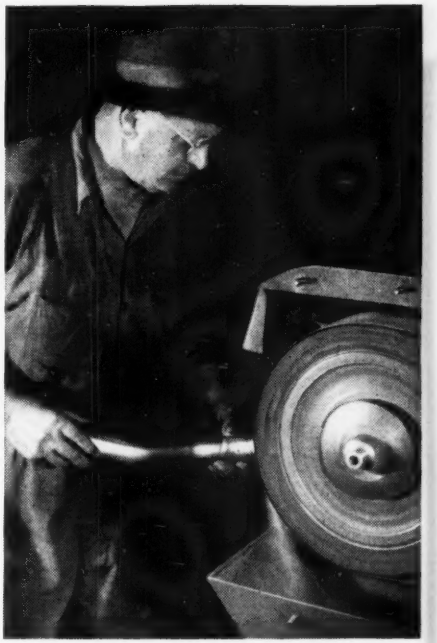

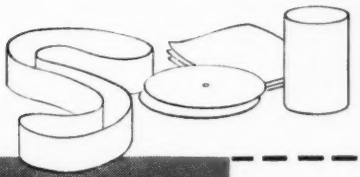

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A letter from the Editor

Dear Reader,

FEBRUARY, 1952

It would be impossible to present an accurate picture of Japanese electroplaters and plating practice in a few words. However, a few statistics as well as some impressions might be of interest.

There are about 3,000 plating shops, or plants with plating facilities, in Japan. In the Tokyo area there are about 1,000 of these plants. In 1949 approximately 25,000 persons were engaged in the industry, including platers, polishers, chemists, shop owners, and managers. Since so many of the plants are located in the Tokyo area, a survey of plating practices in that area can form an excellent basis for an accurate impression of the Japanese plating industry as a whole.

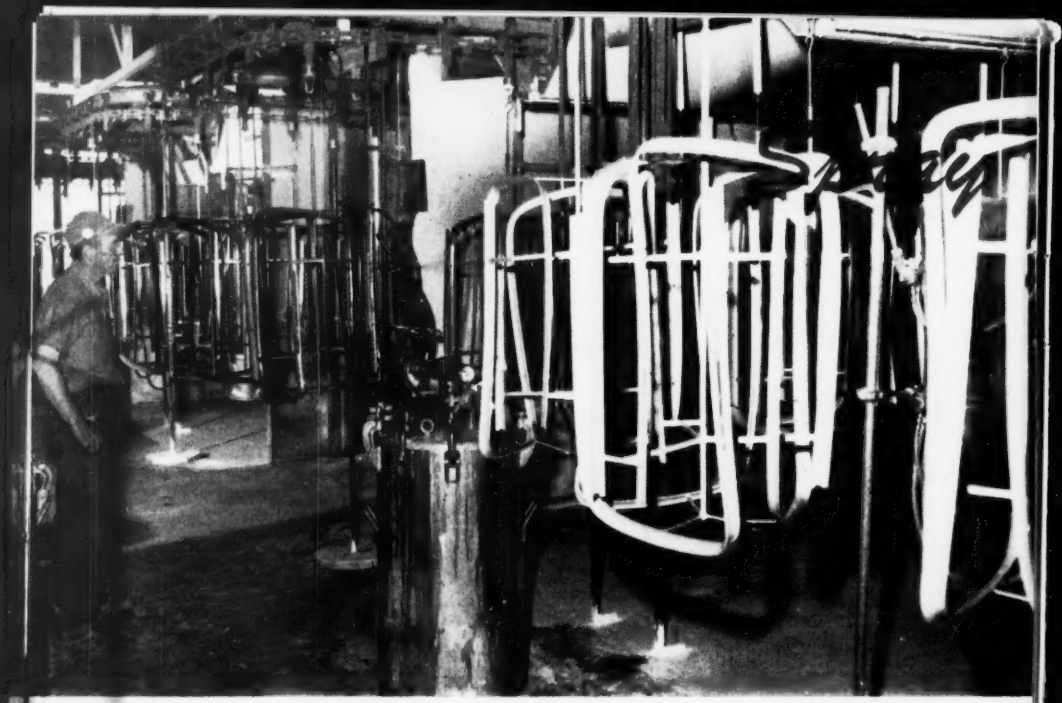
The plating shops or departments, which I have visited thus far, carry out the following plating operations: brass, nickel, chromium, zinc, silver, gold, copper, and black nickel plating; barrel nickel and chromium plating; periodic reverse copper plating; copper and chromium plating on printing rolls; iron and copper electroforming; aluminum anodizing. Techniques employed are, in general, similar to those in use in the U. S. Variations in technique include a room temperature chromium plating solution containing ammonium fluoride, copper deposition for intricate parts with Daniell Cell, and an oxalic acid anodizing solution. Brass is used as an undercoat for nickel and chromium, and some chromium is being deposited direct on copper.

Recently it was my privilege to attend a welcome meeting of the Japanese Electroplating Society in Tokyo and present a talk on U. S. plating practice (see page 116 of this issue). At this meeting of shop owners, directors, managers, scientists and engineers, and representatives of the technical press, among the questions asked were several inquiring as to business conditions in U. S. job plating shops, substitute method for the nickel-chromium system, plating labor costs, and plans for educating plating shop workers. These questions indicate that plating industry problems in Japan are quite similar to those in the United States.

Perhaps each group of platers can make contributions to the successful solution of some of these problems.

Ezra A. Blount

—EDITOR



PF FEATURE

Window and windshield moldings, body grip moldings, seat frames, and outside trim are fabricated and finished with minimum waste of manpower and material in the new, modern plant of The Randall Company. Located on the outskirts of Wilmington, Ohio, hidden from view by sloping hills, the plant is geared for either defense or peacetime production.

Designed along modern lines of industrial architecture, the plant is of the single-story type and provides a straight-line flow for products that are finished, and a U-line flow for those that are shipped unfinished.

All manufacturing operations, from receiving the raw stock to packing the finished products, take place in the main part of the plant. However, the paint shop and the strip room (which is also used to apply a protective coating to truck seat frames) are located adjacent to the manufacturing bays, separated from them by single walls. Sixty feet away from the main building, but in line with the paint shop, is the paint mixing building. Here, paints in sixteen different colors are kept ready for use, being, of course, agitated and mixed before they are sent to the paint shop. Binks and Graco mixing and pumping units are employed for this purpose.

Fabrication

The cold rolled or commercial deep drawn steel that is used in this plant is 0.018 to 0.089 inch thick. Delivered from the rolling mills in coils 36 inches in width by approximately 48 inches in diameter and weighing 12,000 pounds, the steel is lifted onto the loader, the first unit in the slitting line.

Finishing

Automotive Parts Automatically

By FRANK L. BONEM

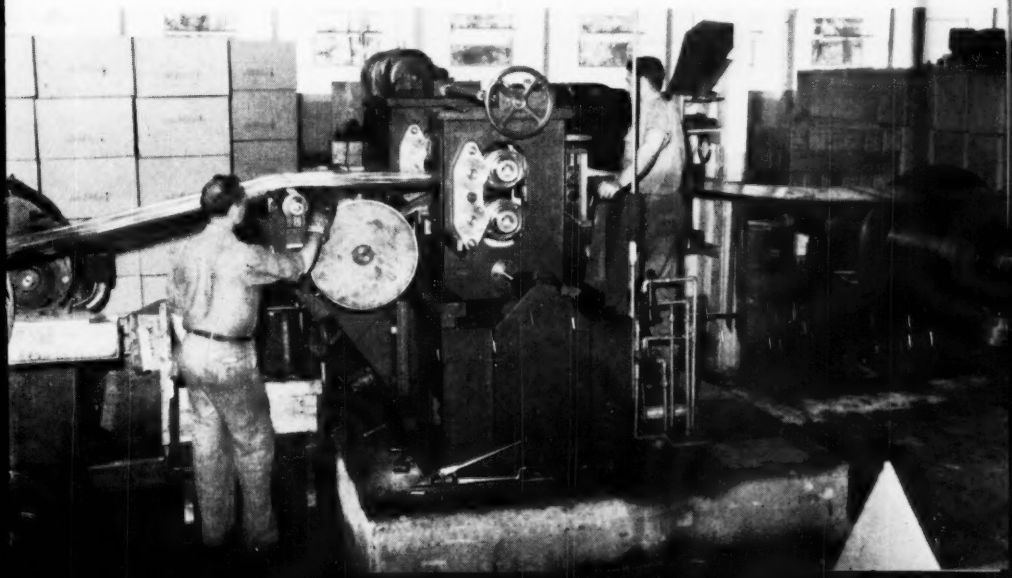
Associate Editor

In the first manufacturing operation the steel is cut into specified width on the slitting line. As shown in Fig. 1, this line consists of an uncoiler, gang slitter, and recoiler.

Rolls of steel, after being cut, are transported by an overhead "I" beam hoist to rolling machines as shown in Fig. 2. These machines, made by Tishken, Dalstrom, and Yoder, cold work the steel to the desired contours by passing it between a series of forming rolls, and also cut the strips to specified length.

Following steps in the manufacturing process consist of cutting louvers, piercing holes, and trimming the end, the latter two operations being made on Randall-designed hydraulic piercing units. The parts then pass on to chain benders

Fig. 1—A slitter cuts the sheet steel to the desired width. The machine unwinds the coil (shown at right), slits the steel, and rewinds the strips into new coils (at left of photo).



where moldings are bent to the desired shape and the final form impressed upon them. These chain benders, originally from Tishken, have been developed to their present form by the Randall Company. They operate with a Kellered form and arbor, the latter, made of phosphor-bronze, being held against the work by air pressure (see Fig. 3).

Depending upon the car model in which the moldings will be used, they may or may not be butt-welded. If the joints are welded, the weld is sanded on 120 grit emery belts, as shown in Fig. 4. For some of the rougher work done by this company, an 80 grit belt is used, the belts being Aloxite coated abrasive belts in either case.

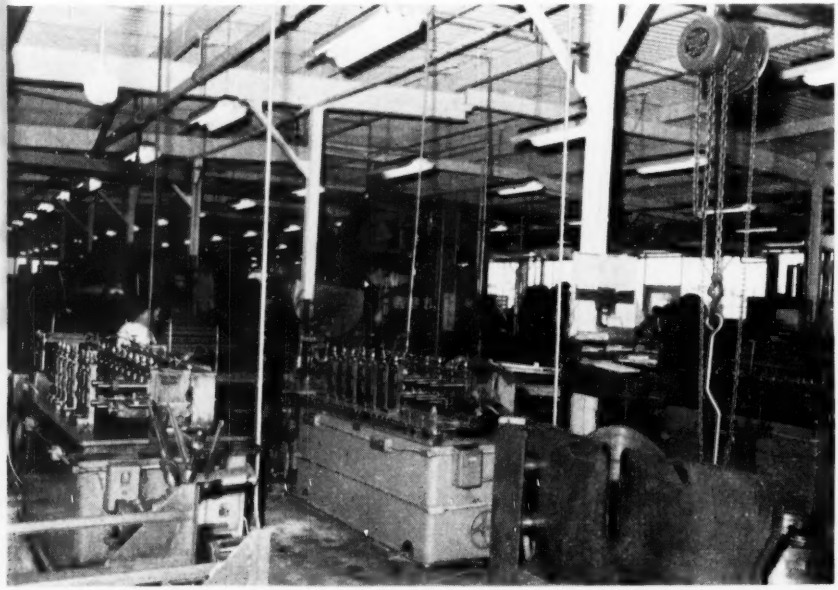
Seat frames for trucks are made by passing the steel strip through a tubing mill which rolls the strip into a tube, welds the seam, and cuts it to the specified length. The tube sections are then bent to shape and welded together to form the frames.

Finishing Car Moldings

Formed metal parts are relatively free from contamination having only a light oil film and free carbon deposit from the rolling mill. Consequently, the finishing process is fairly simple, the steps in the conveyorized cleaning and painting process being as follows:

1. Spray clean with DuBois Acid Cleaner No. 2 at a concentration of 2 oz./gal. and a temperature between 175-180 deg. F.
2. Spray rinse with clear water at 170-180 deg. F. Both the cleaning and rinsing are timed to last 1½ minutes.
3. Dry at 400 deg. F. for 2 minutes.
4. Apply primer coating in spray booth. This coat consists of Berry Brothers No. 4415-B and No. 32 primer.

Fig. 2—Desired forms of the strips are achieved by feeding strip stock through a rolling machine which rolls the shape and cuts the strips to length.



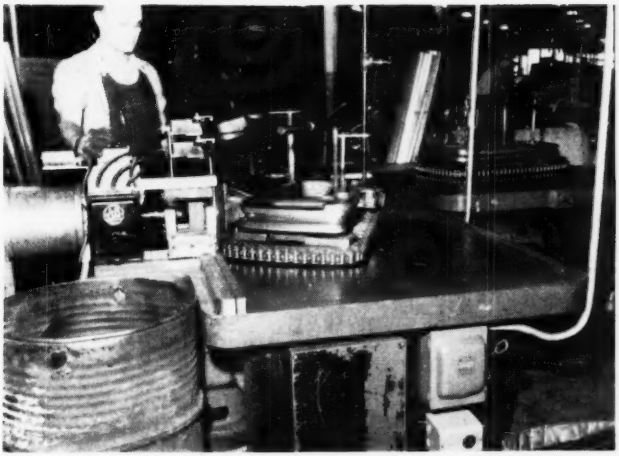


Fig. 3 — This view shows how a chain bender is used to bend and give final form to the window moldings.

5. Bake at 320 deg. F. for 7½ minutes.
6. Apply first color coat.
7. Apply second color or clear coat.
8. Bake at 320 deg. F. for 7½ minutes.

The cleaner, which is used for these parts, is of the emulsion type and contains phosphoric acid. The primer coat is a special metallic paint containing aluminum which was developed especially for use on cars. It is to be noted that in this application only a very thin coat is necessary. The paint used for the second and final coat is of the metallic, synthetic type.

Solvents which were found most suitable for these paints, which are applied electrostatically, were Amsco SC No. 3 and Shell No. 407. The former is fast drying and the latter is slow drying, the two being used together in a 50-50 mixture.

Layout and Equipment

In the layout of this finishing system equipment has been arranged in such a manner that only three operators are required in the finishing department proper. Engineered by the Young & Bertke Company, the units comprising this system are: a washing and rinsing machine, dry-off oven, prime coat oven, three paint booths, and a finish coat

Fig. 4 — Sanding a butt-weld on a window molding, employing an abrasive belt machine.

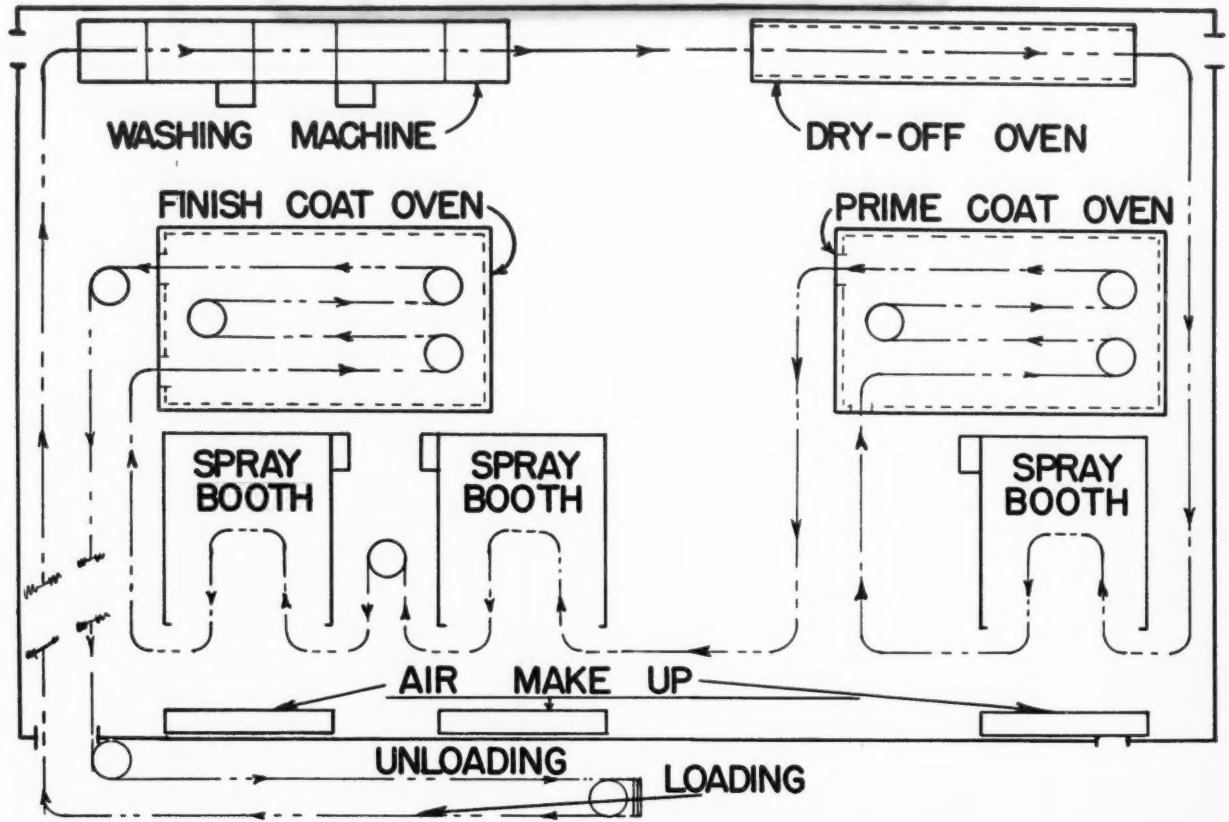


Fig. 5—A plan view of the finishing department, showing the arrangement of equipment and conveyor travel.

oven. As may be seen from Fig. 5, the units are so arranged that there is ample clearance between the individual units, yet the total floor space is kept to a minimum.

The whole system is, of course, conveyorized, the loading and unloading area being in the main plant (see Fig. 6). The conveyor is 864 feet long and of the overhead monorail type. It rides on a 3-inch "I" beam and has 288 racks suspended from it at 36-inch centers. The rate at which the parts travel through the system is 14.5 f.p.m. As may be noted from the various illustrations, the connecting bar between the conveyor and rack fixture has a small cylinder near the top. These cylinders cause the racks to rotate when rubbed against belts placed below the conveyor; thus, rotation of the racks can be achieved wherever desired. In this finishing system, the fixtures are rotated in the washers, dryers, and paint spray booths. Figure 7 shows moldings moving toward the washer (left conveyor), and toward the unloading area (right conveyor).

The racks from which the moldings are suspended are of the company's own design, based upon the recommendations of the Ransburg Electro-Coating Corporation. In order to position the various sized parts properly in the electrostatic fields of the paint booths and to obtain maximum efficiency in

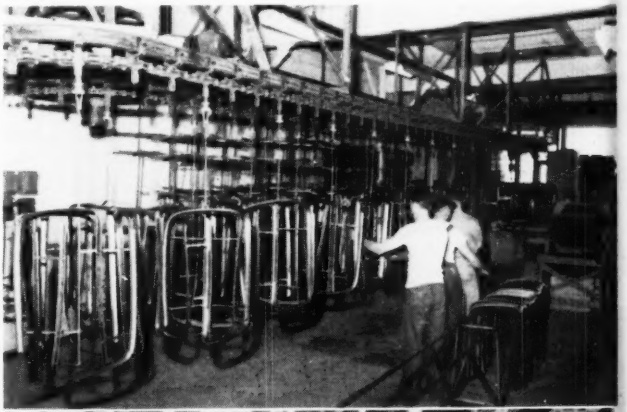
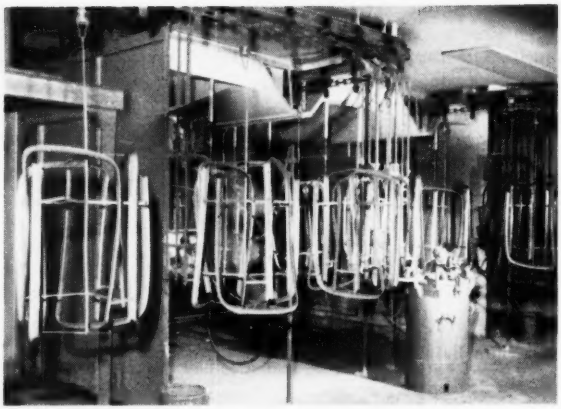


Fig. 6—A view of the loading and unloading area, the only part of the finishing system in the main plant. The loading area can be noted in the foreground.

Fig. 7—Window moldings are transported from the loading area to the washing machine (left background). Parts in the right foreground are en route from the final bake oven to the unloading area.

Fig. 9—Ford window moldings leave the primer booth and go to the prime coat oven.

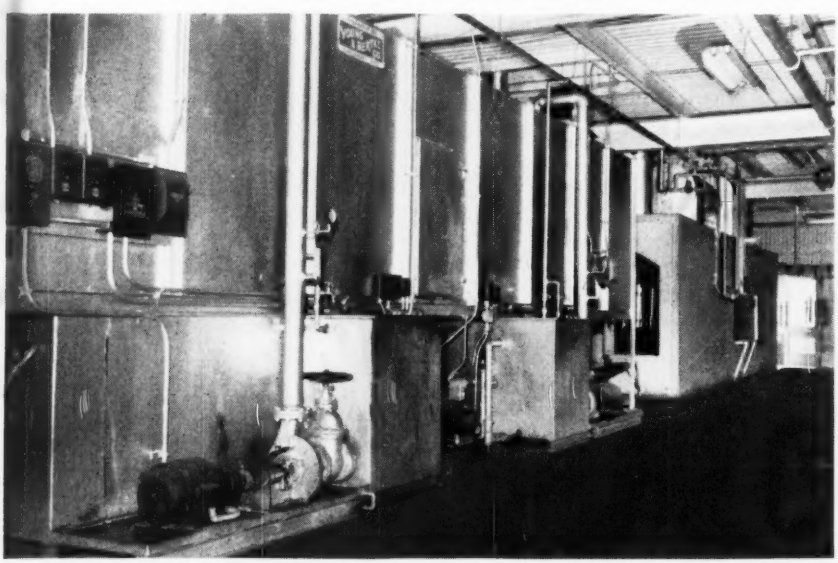


conveyor loading, five different rack designs are employed.

Products are washed and rinsed by being rotated under banks of nozzles in the washing machine. The washing (and rinsing) machine has two exhausts, one for each compartment. Both solutions are recirculated, and temperatures in each unit are controlled automatically. The dryer, which is located right next to the washing machine (see Fig. 8), uses gas heat. It is of the hot air recirculating type and therefore needs only 10 per cent of its total volume in fresh air for makeup.

All painting is done in spray booths utilizing Ransburg's No. 1 Electro-Spray Process. There are two fields in each booth, one on each side (see Fig.

Fig. 8—Washing and rinsing unit (left) and dryer in background. Pump and storage tank of the recirculating system may be seen in the foreground.



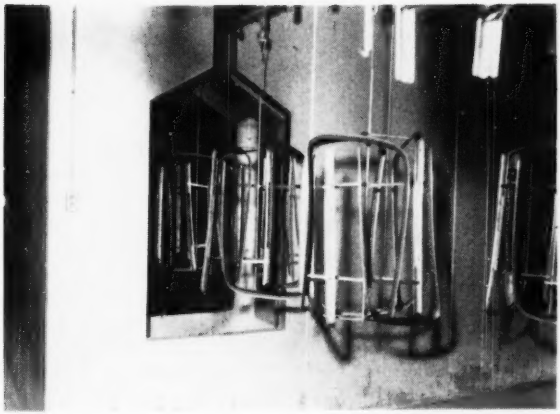


Fig. 10 — Window moldings leave the finish coat oven, ready for packaging and shipment.

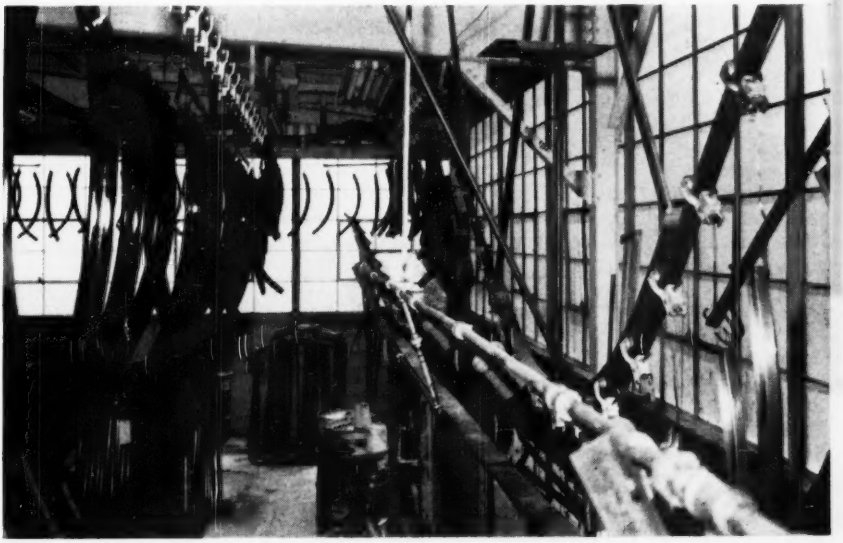
●

9). Each field has two spray guns, and as the parts rotate while passing through the fields, they are painted going in and coming out. The field is maintained at a difference in potential of 140,000 volts and carries 1/1000 of an ampere. Should this field be broken by the parts swinging into the electric field, a red light and bell warn the operator.

Pressure in the spray guns depends upon the paint being used. Fluid pressures range from 2 to 6 p.s.i. and atomizing air from 25 to 35 p.s.i. In the first booth where the primer coat is applied, small spray gun tips are used since a thin coat is desired.

In the second booth the cover or major coat is applied, large tips on the spray gun being used for this purpose (see article heading). In the third booth a thin deposit of the same cover coat

Fig. 11—Applying a protective coating to seat frames and interior strips by dipping and air drying.



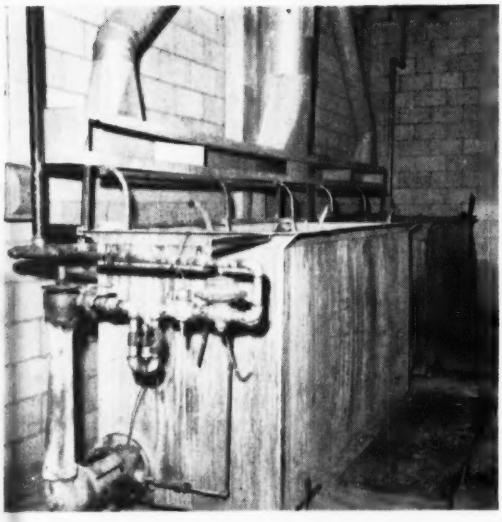


Fig. 12—Stripping and rinsing tanks for conveyor racks. *(All photos by PRODUCTS FINISHING)*

or a clear coat is applied with fine tips. The purpose of this second coat is to achieve the high quality finish required. The total film thickness of the coating thus applied is 2 mils.

In the rear of each paint booth is a waterfall for collecting the low percentage of paint that bypasses the parts being painted. Paint thus lost amounts to two-thirds of a barrel per day. This, it is stated by the paint foreman, is very low in comparison with hand spraying, a substantial saving in paint being realized.

After receiving the primed coat, parts pass through the 27-foot 8-inch primer coat oven. After the first application of the final coat, the parts are allowed to air dry for 4½ minutes through a U-bend in the conveyor; after the final application of the paint, the parts are dried in an oven similar to the one used for baking the prime coat. Both of the refractory Burdett Ovens use infra-red radiant heat gas burners for their source of heat (see Fig. 10).

To avoid spoilage due to dust and other minute particles in the air and thus get a better finish, the spray booths are kept under a slight pressure. Air is withdrawn from each booth by 54-inch diameter exhaust ducts. Fresh air is supplied through air make-up units, which are located in front of each spray booth. These units are automatically controlled; and filter, temper, and, in winter, heat the air.

Finishing Seat Frames

Seat frames, and certain other types of moldings, receive a temporary protective coating. This coating, EWB-83 made by the Cincinnati Varnish Company, has an asphalt base and is applied in a mechanized setup by dipping and air drying (see Fig. 11). The work is suspended from a Buschman Universal Cable Trolley Conveyor approximately 246 feet long. The rate of travel of this conveyor is 4 f.p.m. and allowance is made for the 45-minute drying period this type of coating requires.

Stripping

To keep contacts on the conveyor racks in good working order, they are stripped once a week. This operation is done in two tanks of 700-gallon capacity each. The first tank contains a caustic, Klem Chemical Strip Aid, which is used hot. The second tank is used for rinsing, being filled with water. Temperature control on the first tank is automatic and vapors are drawn off through a header connected to three stacks (see Fig. 12). A basket, connected to an overhead monorail hoist, is used to dip the racks into the cleaner and rinse tanks.

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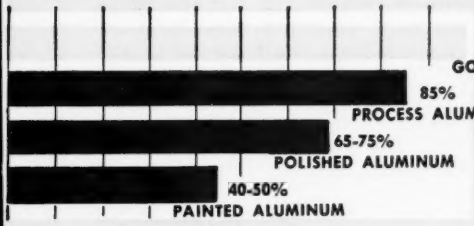

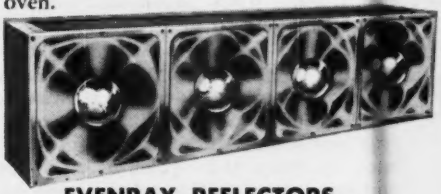

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Bright Dipping Brass Compacts

By MARVIN RUBINSTEIN
Electroplating Consultant to The Government of Israel

BRIGHT dipping is the orphan child of the finishing industry. Fewer operations require more exacting techniques, more precise timing, more ingenious "angles" in setting up a tricky item for batch production. Solution concentrations change too rapidly for analysis to be effective. Odd shapes create drainage, dragout, and rinsing problems. Freshly dipped metals often tarnish with such rapidity that quick drying becomes a "must." The answers are all "rule of thumb"; no laboratory manual or supplier's instructions offer much guidance or help.

The author has successfully tackled many bright dipping problems, but two particular operations are of special interest. The first was at a time when brass stock became unobtainable. The Hickok Manufacturing Company of Rochester, N. Y., was manufacturing a brass suspender clip consisting of three parts, all bright dipped and barrel burnished. The problem was to replace these parts with brass plated steel without changing the finish. The answer consisted of a five-hour barrel brass plate in large loads, followed by bright dipping in baskets and wet tumbling. Barrel brass plating a constant color was a headache in itself, but the bright dipping took a special kind of skill. Split-second timing was required. If too short a dip was employed the clip wasn't bright enough. With too long a dip, a steel or motley colored part would result. In the bright dipping timing cannot be done by the clock.

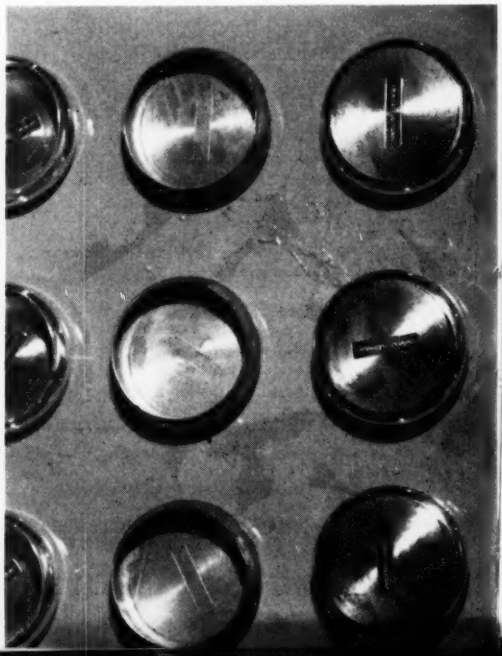
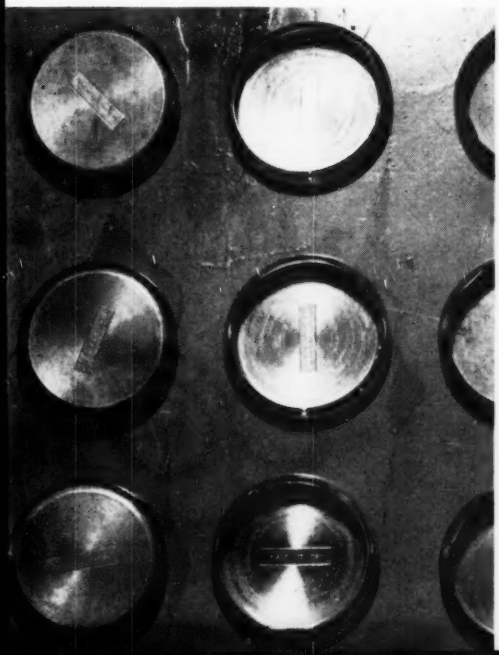


Fig. 1—(right) Alternate rows of compacts, both before and after bright dipping. Note the high degree of reflectivity on the dipped compacts, particularly on the inside surfaces.

Marvin Rubinstein attended Cornell University where he studied chemistry and chemical engineering. Since 1943, he has served in various positions as a chemist, plater, plant manager, sales engineer, and consultant. He is presently in Israel as a consultant with the Israeli Government on aircraft finishing problems.

The proper timing depends on the age and strength of the bath, its temperature, and the degree of agitation and rinsing. Only the man behind the basket can time for optimum results—by eye, by feel, by instinct. So here was a case where the procedure was easily set up and the dips easily controlled; but timing was the tricky part of the operation.



Requirements of the Operation

In a more recent problem, the bright dipping of pouch-type compacts at Lerick, Inc., timing was not the crux of the matter; here, the difficulty was setting up an effective procedure to overcome troubles in cleaning, proper drainage, and drying of a bowl shaped item. The item to be dipped was the bottom of a pouch-type compact, a round brass shell about 2¾ inches in diameter, and ⅝ inch deep. All around the circumference, the sides were "bellied" outward, so that the diameter at the opening on top was only 2⅜ inches and the diameter of the flat portion of the base was 2½ inches. Some bases were plain; others had a simple design of numerous concentric circles. All had two holes on the top rim for inserting the pin which fastens the cover to the compact. Most parts were made of a

gold colored brass, about 87-13 in composition. The metal was moderately clean, having only a slight, though irregular tarnish, and covered with a light layer of water soluble oil.

Since, in a subsequent operation, all outside surfaces were to be buffed and colored, the results of bright dipping the insides were of paramount importance. The problem was to get a clean, dry, regular bright dipped finish on the shell, with particular emphasis on the insides where the only extra finish was to be a coat of lacquer. This had to be done consistently, in large production lots, using a minimum of time, labor, equipment, and additional expenses.

Handling and Drainage

The depth and peculiar shape of this compact made proper drainage the paramount problem of the operation. Naturally, mounting the parts on well designed racks would have given the best drainage possible. Just as naturally, this was not the efficient answer. It would have meant purchasing a number of expensive racks plus an extra racking operation plus an extra unracking operation. In addition, a good sized rack could not have handled more than fifty parts at the most, probably less. To dip 5,000 compacts a day in this fashion was out of the question if any other way could be found.

Finding racks unsuitable, baskets were considered. This eventually solved the problem, but not without difficulties. The baskets were loaded by hand, each compact bottom being placed face downward as neatly and as compactly arranged as possible. A wire screen, slightly larger in diameter than the basket, was forced into position on top of the load to keep the parts from rising out of the basket during the dipping operation.

Troubles arose immediately. Those compacts which remained in position did not clean, bright dip, or dry properly. Each compact served as an air-tight compartment, trapping an air bubble which prevented the solution from reaching large areas of the inside of the compact. Similarly, water vapors were trapped during the drying operation, preventing the inside from drying. Also, the round shape of compact bottoms kept them from clustering effectively, and many shifted positions in spite of the wire screen. The result was that those compacts which had turned over or on one side acted as scoops, collecting and dragging out large volumes of solution, giving bad finishes and ruining the dips.

After trying several variations of racking positions, a successful

Fig. 2—Arranging compacts in baskets for cleaning and bright dipping. Note the wire screens used to separate layers of compacts.

Fig. 3—Degreasing compacts in basket lots. The baskets are held at a 45 degree angle and rotated through a complete turn.

loading arrangement was found. The compacts were arranged in layers, face down. Between each layer was placed a stainless steel screen, slightly smaller in diameter than the basket; the tight "holding" screen was placed on top. This arrangement kept the compacts from shifting and changing positions, thus eliminating any drag-out difficulties. To solve the entrapped air bubble problem, a simple process was used. Extra large containers were employed for the acid solutions. Instead of dipping the baskets vertically, they were dipped at a 45 degree angle to the surface, and rotated clockwise through a complete turn. The inevitable air bubble resulted; but, rotating the basket caused the bubble to travel competely around the inner rim. Likewise, the solution followed the bubble around this course, making thorough contact with all the surfaces of the compact.

A stainless steel basket 10 inches high and 10 inches in diameter was found best for this job. The basket was constructed of 4 x 4 mesh made of 0.063 inch diameter wire and had a sturdy, inflexible handle. Separators, also of 4 x 4 mesh (0.052 inch diameter wire) were cut to a diameter of 9¼ inches. The top screen for holding the load in place was a 10-inch square of 8 x 8 mesh

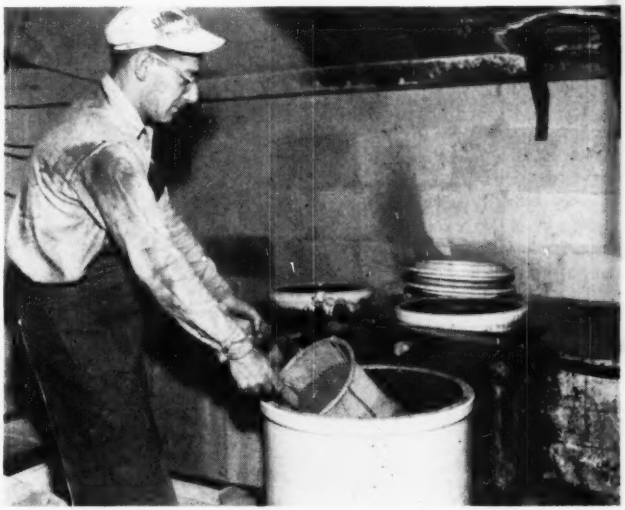


Fig. 4—Bright dipping operation. Here again the baskets are held at an angular position and rotated to avoid air bubble marks on the inside of the compact. Note crocks in the cold water tanks in background.

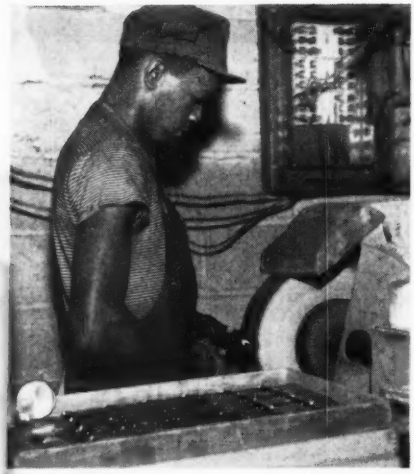


Fig. 5—Buffing the bases of the compacts. This operation is carried out on an automatic buffing machine.

(0.032 inch diameter wire) that had been bent over so that it just managed to fit into the basket and stick there. With this setup there were 10 compacts to a layer and at least 10 layers of compacts to a basket—a total of 100 compacts per load. Five thousand compacts a day were bright dipped by this method.

Cleaning

As was mentioned previously, a thin film of water soluble machining oil had to be completely removed before the compacts were ready to be bright dipped. Since the compact metal is relatively thin (0.016 inch) and heats up rapidly in a degreaser, a simple vapor-type degreaser is usually unsatisfactory. Insufficient condensate is formed and inadequate cleaning results. Also, as in every other operation, one had to remember to completely rotate the basket in each cleaning bath to ensure solution contact all over the inside of the compact.

To satisfy these requirements, the following procedure was used. A two-compartment degreaser was used. Perchlorethylene, rather than trichlorethylene, was used as a solvent, in order to increase the effective quality of condensate. After loading, the basket was held in the vapor compartment of the degreaser for twenty seconds, dipped in the liquid solvent, and returned to the vapor for about ten seconds more

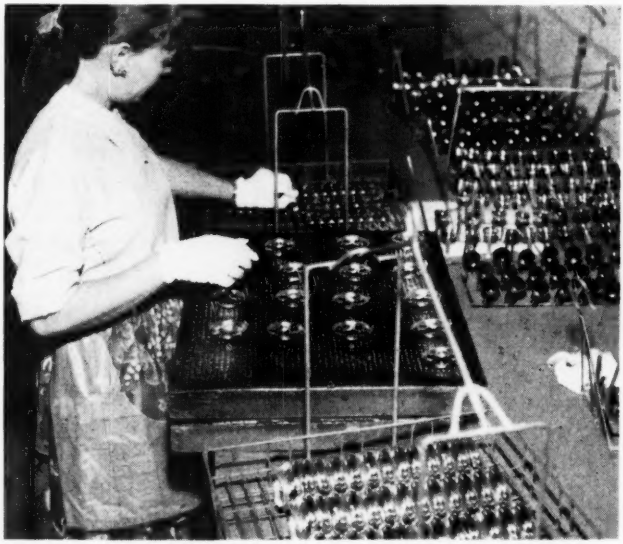


Fig. 6—The compact bottoms are degreased in special type baskets after being buffed. They are then laid out on screens for lacquering.

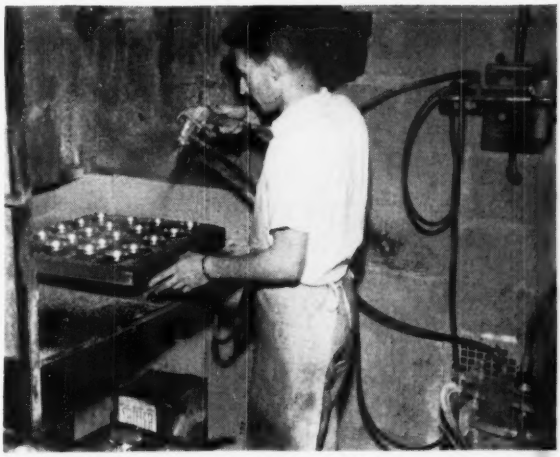


Fig. 7—Spray lacquering the insides of pouch type compacts. Bright dipping is the only brightening operation which has been used on the insides of the compacts.

before being slowly withdrawn. This was followed by a 30-second dip in a solution of boiling potash (5 oz./gal.) to remove any stubborn dirt spots or solvent films remaining. Two running water rinses were next employed to remove all traces of alkali. Through all these steps, the basket was immersed at a 45-degree angle to the surface of the solutions and rotated through at least one complete turn.

Bright Dipping

Following a thorough rinse and drain, each basket of work was then given a good bright dip of from 10 to 40 seconds. Though several types of dips are satisfactory, a conventional bright dip of the following composition was used:

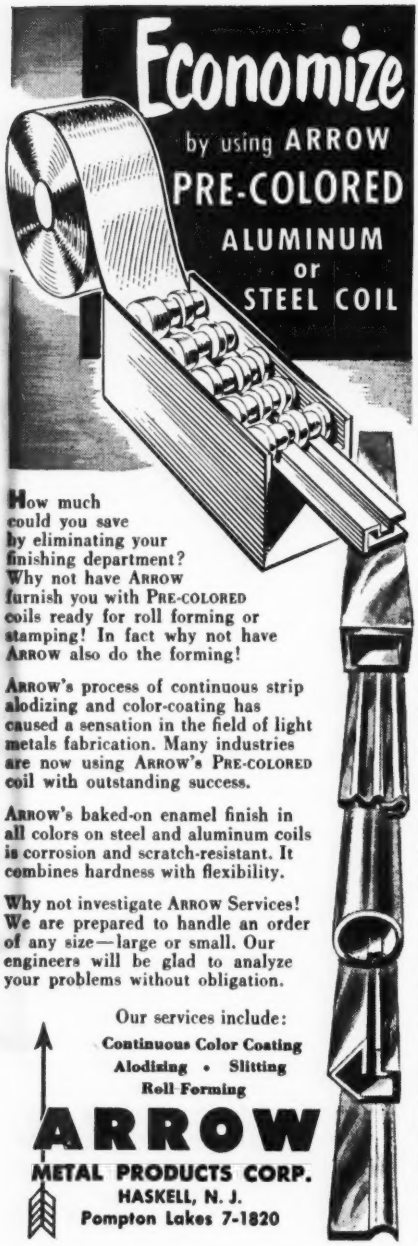
Sulfuric acid	12 gallons
Nitric acid	6 gallons
Water	1½ gallons
Muriatic acid	3 ounces (fluid)
Wood Soot (carbon black)	as needed

Large diameter 20-gallon crocks were used as containers. This large volume served to maintain the acid concentration better, and afforded ample room for manipulating and rotating the wire baskets.

Two dips were maintained in the production line so that one would always be available while the other was being refilled or renewed. In addition, a 40-gallon storage tank was maintained, so that fresh, properly made solution, would always be ready to replace the considerable dragout from the acid dips. In making up the storage solution only one third of the normal proportion of water was used. This was done to compensate for the large water dragin during the bright dipping operation. A couple of handfuls of soot were added to each new storage solution.

Timing was extremely important. For a fresh or strong bath, fifteen seconds in the dip was ample. As the dragin increased the water content of the bath, only 8 to 10 seconds in the bath produced a good bright finish. However, an optimum water concentration was reached, and from then on the dipping time necessary quickly increased to the point where as much as 40 seconds were needed. A bath requiring more than 40 seconds generally gave inconsistent or "half-dipped" finishes and had to be renewed with an acid addition. Ordinarily, baskets were rotated and thoroughly drained before bright dipping. However, where a bath was slow due to a low water content, the operation could be sped up by dipping the compounds while they still had a heavy water film on them.

After the bright dip, the baskets were drained while rotating and thoroughly



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rinsed in two consecutive running water rinses. Proper time for draining was about 5 seconds, a compromise between a maximum saving of acid solution and a minimum of over-etching of the metal. The two water rinses were followed by a dip in a cyanide solution (4 oz./gal. of sodium cyanide) to remove any tarnish caused by the nitrous oxide fumes rising from the bright dip. Naturally, an efficient ventilating hood was used, but some tarnish due to fumes still occurred, particularly in very fresh or in nearly spent dips. Two additional running water rinses followed the cyanide dip. The drying operation completed the process.

Process Control

Control of the quality of the bright dips depends upon an accurate knowledge of the function of each constituent in aiding the brightening action. The nitric acid serves as the primary dissolving agent. However, in the absence of sulfuric acid, its action would be too severe and create an etched surface. The sulfuric acid serves to inhibit the action of the nitric, thereby ensuring smoother, less etched finishes. In using a bright dip for copper, the muriatic acid would not be necessary. With brass, however, muriatic serves the important function of coordinating the solution of both the copper and zinc in the alloy. In the absence of muriatic, nitric acid dissolves more copper than zinc. The excess zinc remaining on the surface leaves a dull, grayish finish. Thus, if the operator notes such a finish, he knows immediately that the bath requires an addition of muriatic (hydrochloric) acid.

For ease of control, sodium chloride (table salt) is used in controlling the chloride content of the solution in place of the muriatic acid. One or two handsful will usually suffice to correct the aforementioned condition. An excess of chlorides, either as salt or muriatic acid, creates a condition in which more

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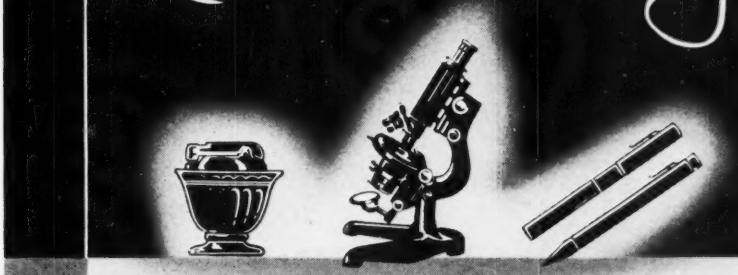

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zinc is dissolved from the surface than copper. Thus, when the operator notes a dull, reddish finish, he knows that there is too much chloride in his bath. This is not as easily overcome. If the bath level is low, he can decrease the percentage of chloride by adding more sufuric and nitric acids in the ratio of two to one. Otherwise, he can add another handful of soot, mix it thoroughly, and skim it off the top when it rises. The soot will adsorb excess chlorine.

Water in the bath allows the various acids to ionize, or dissociate, thus increasing the speed of the bright dipping action. Acids in their concentrated forms dissociate very little. With sufficient water in the bath for proper dissociation, the nitric and muriatic acids "attack" the metal surface, forming nitrates and chlorides of both copper and zinc. These in turn react with the sulfuric acid to form hydrated sulfates, which precipitate in the solution, leaving the nitrate and chloride ions available for further attack. In the absence of enough water, both the initial action of the acids and the subsequent regeneration through the formation of hydrated sulfates is considerably slowed down. Thus, if a fresh or strong bath is working too slowly, merely add water. Naturally, as previously noted, too much water will also slow down or eliminate the bright dipping action, since not enough acid will be present to do the work.

The function of wood soot (or any other type of soot) in the bath is still open to argument. As previously mentioned, it is particularly useful where an excess of muriatic acid exists, the probable explanation being preferential adsorption. Of course, it may have an inhibiting action of a different sort. In addition, the soot undoubtedly serves much in the way that a wetting agent would. It serves to ensure better contact of the solution with the work and tends to form a foam blanket

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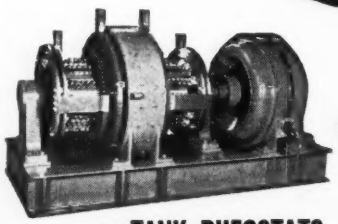

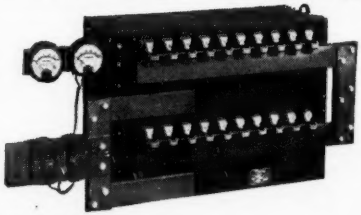

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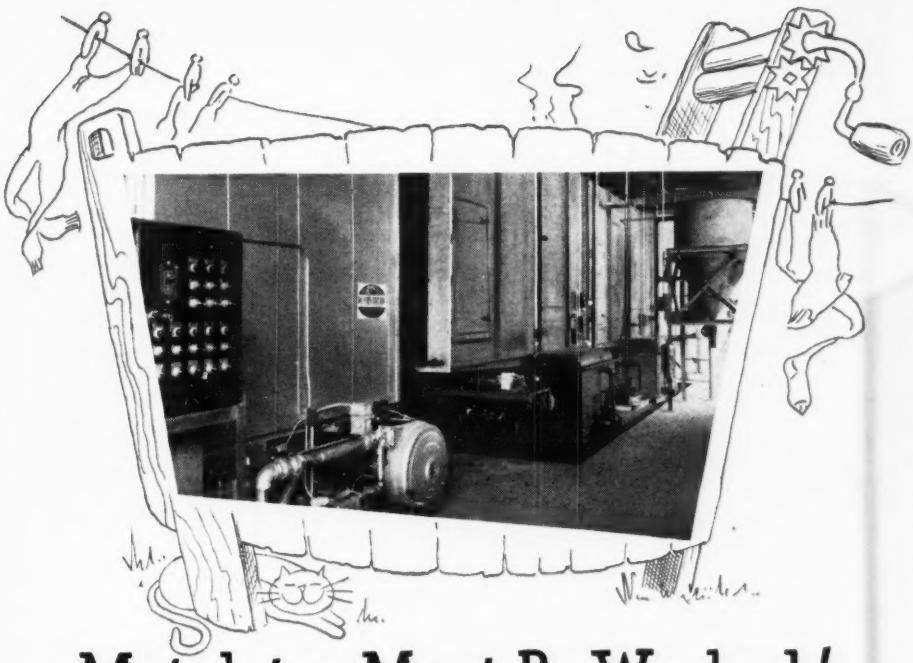

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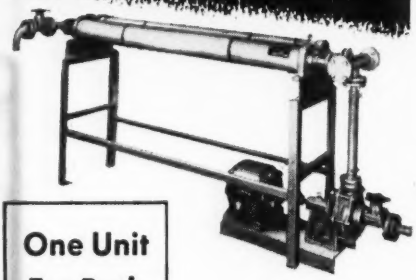

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at the surface. This surface layer helps control fuming and ties up at least some of the grease or dirt, which may be dragged into the bath.

Temperature of the bath is an important variable. An increase in temperature acts much like an excess of muriatic acid, resulting in a redder, more coppery finish. It also rapidly increases the rate of solution; a rise of 18 deg. F. makes a bath work about twice as rapidly, often to an extent where excess etching occurs. For best and most consistent results, the bath should be operated at room temperature. However, everything about the bath tends to increase its temperature. Making up a new bath releases heats of solution and formation. Adding water to any bright dip releases heat of hydration. Working the bath releases heat of reaction. As a result, new baths must be cooled over night before use. Crocks and acid containers should be immersed in cold running water during operation. Baskets of work should be thoroughly drained before dipping to keep dragin to a minimum. At this point, it would be wise to note that in making up a new solution, the acids should be added slowly to the water rather than the water to the acids. Such a large quantity of local heat is released in adding water to sulfuric acid that a nasty explosion is apt to occur. Reversing the procedure prevents this.

Drying Bright Dipped Compacts

The drying operation was most difficult to design and specify. Initially, four conventional methods of drying were considered. These were: direct drying after a dip in boiling water, sawdust drying, force drying in an oven with an attached blower, and drying in a degreaser. These methods did not solve the drying problem satisfactorily.

Failing to dry the work by conventional means, other methods were tried. A water displacement liquid was considered. Water displacement liquids

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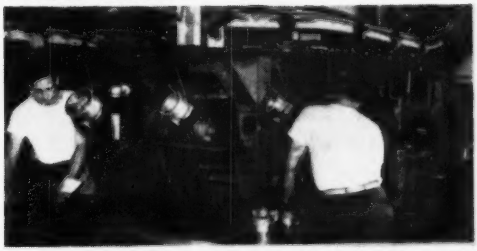

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have a lower specific gravity than water; thus, when wet work is dipped into them and agitated, the liquid displaces the water at the surface of the work, and the water sinks to the bottom of the container. The displacement liquid is more volatile than water. When the work is pulled out, the displacement liquid dries much more quickly than water would. Finally, the water displacement liquid is much less corrosive than water and will not ordinarily tarnish brass.

Experimental work showed that though the water displacement liquid did displace the water and did evaporate more quickly from the parts, some of the vapor was always trapped inside the compact. The perfectly dry surface needed for successful lacquering was not obtained. To solve the problem, the basket of work was dipped into the water displacement liquid at the usual 45-degree angle and given a complete revolution in the solution for about 15 seconds. It was then thoroughly drained while being rotated and twirled by hand. This was followed by a dip into a degreaser using perchlorethylene as a solvent. The brass compacts then came out bright and bone-dry—ready for immediate lacquering.

Details of operation of this process include the fact that the displacement liquid was held in a twenty-gallon crock with a spigot at the bottom. The water at the bottom was drained off regularly through the spigot; fresh solution was used to replace it. Thorough draining should follow the dip into the solvent, both to save an expensive material and to prevent contaminating the perchorethylene too rapidly. A two-compartment degreaser was used, the work going from the vapor phase to the boiling liquid stage back to the vapor phase. It was then slowly removed from the degreaser. Naturally, the basket was held diagonally and rotated completely during each step. The degreaser

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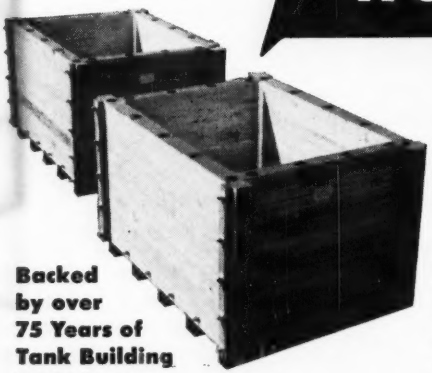

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used for drying was not used for any other operation, and was cleaned regularly. Care was taken to keep water out.

Great care had to be taken to rinse thoroughly in clean running water before going into the displacement liquid. Acid or cyanide dragin, or any impurities from the water rinse, acted as emulsifying agents in the displacement liquid. This was particularly true if wetting agents from any commercial cleaners were present in the rinse water as dragin from some other operation. When rinsing was incomplete, a thick white emulsion composed of water, displacement liquid, and impurities resulted. This emulsion, although it never settled out, did not immediately affect the work; it did, however, form a scum which would eventually ruin the degreasing solvent. This shortened the life of both the degreasing solvent and the rather expensive displacement solvent. Careful rinsing prevented all of this.

Summary

To summarize, a good procedure for bright dipping pouch type compacts is as follows:

1. Load in baskets.
2. Degrease, 1 minute.
3. Hot potash, 30 seconds.
4. Double cold water rinse.
5. Bright dip, 10 to 40 seconds.
6. Double cold water rinse.
7. Cyanide dip, 10 seconds.
8. Double cold water rinse.
9. Water displacement liquid, 15 seconds.
10. Dry in degreaser, 1 minute.
11. Unload.

Bright dipping odd-shaped and hollow items presents a myriad of difficulties. The problems can be solved, but extreme care and ingenuity must be shown in developing procedures for handling, cleaning, dipping, solution control and drying. When this is done, excellent results can be obtained.

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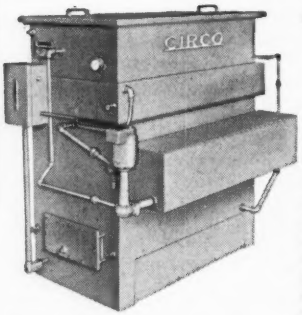

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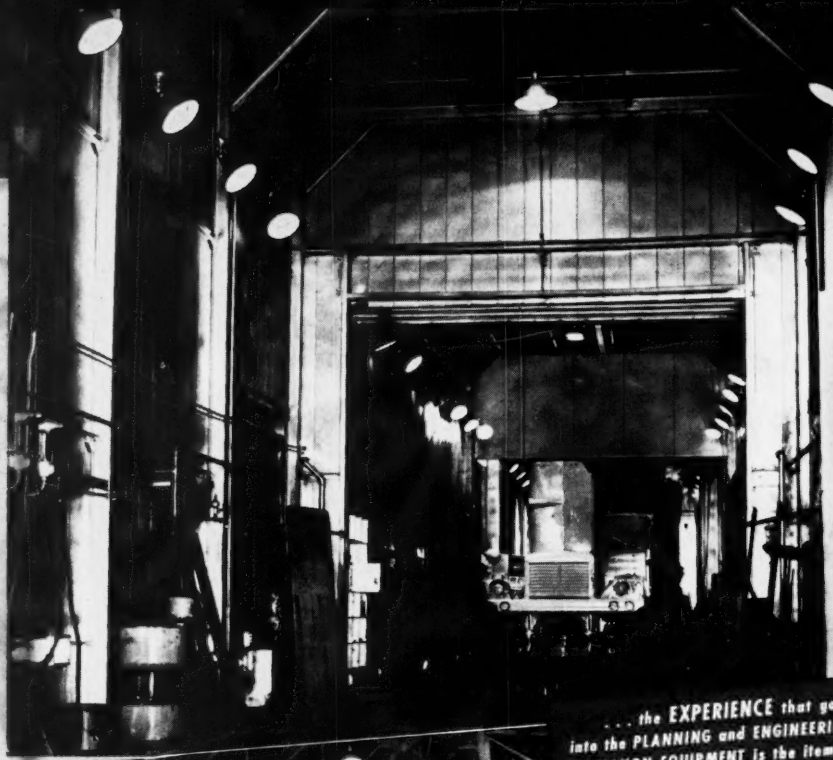

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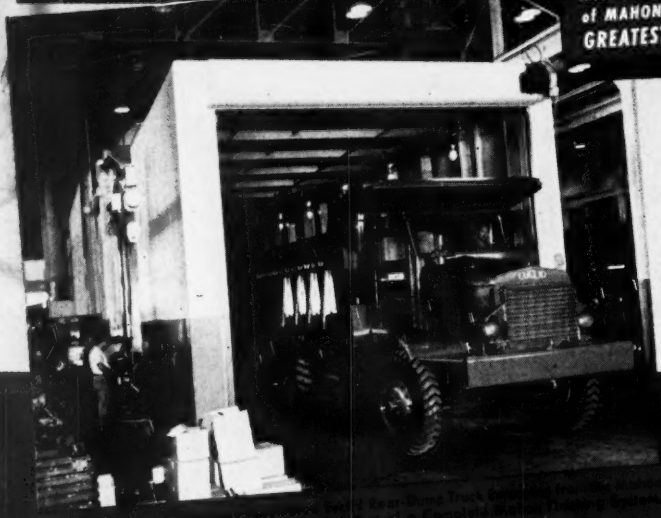

At Right Above: Mahon Hydro-Filter Spray Booth Specially Designed to Accommodate the Large Units of Road Building Machinery and Special Vehicles Produced by The Euclid Road Machinery Company, Cleveland, Ohio. Above: Interior View of Painting Production Line Looking from Cleaning and Masking Booth through the Hydro-Filter Spray Booth—Finish Baking Oven is Beyond Spray Booth.

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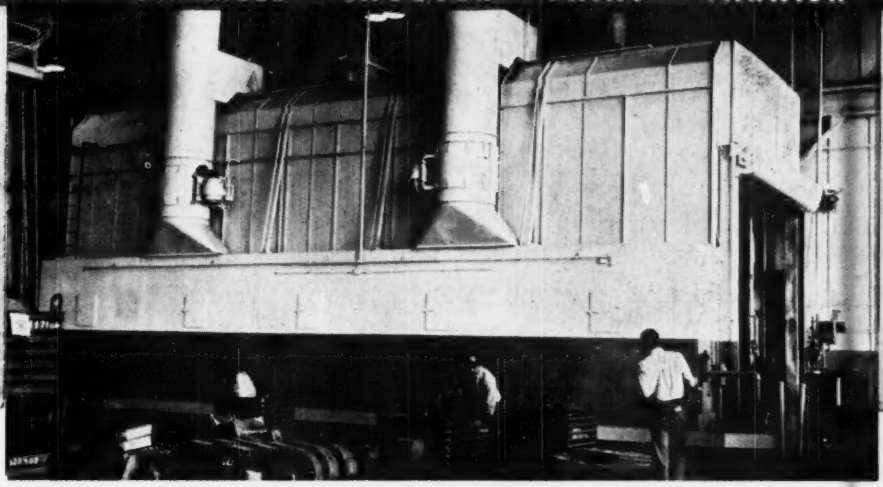

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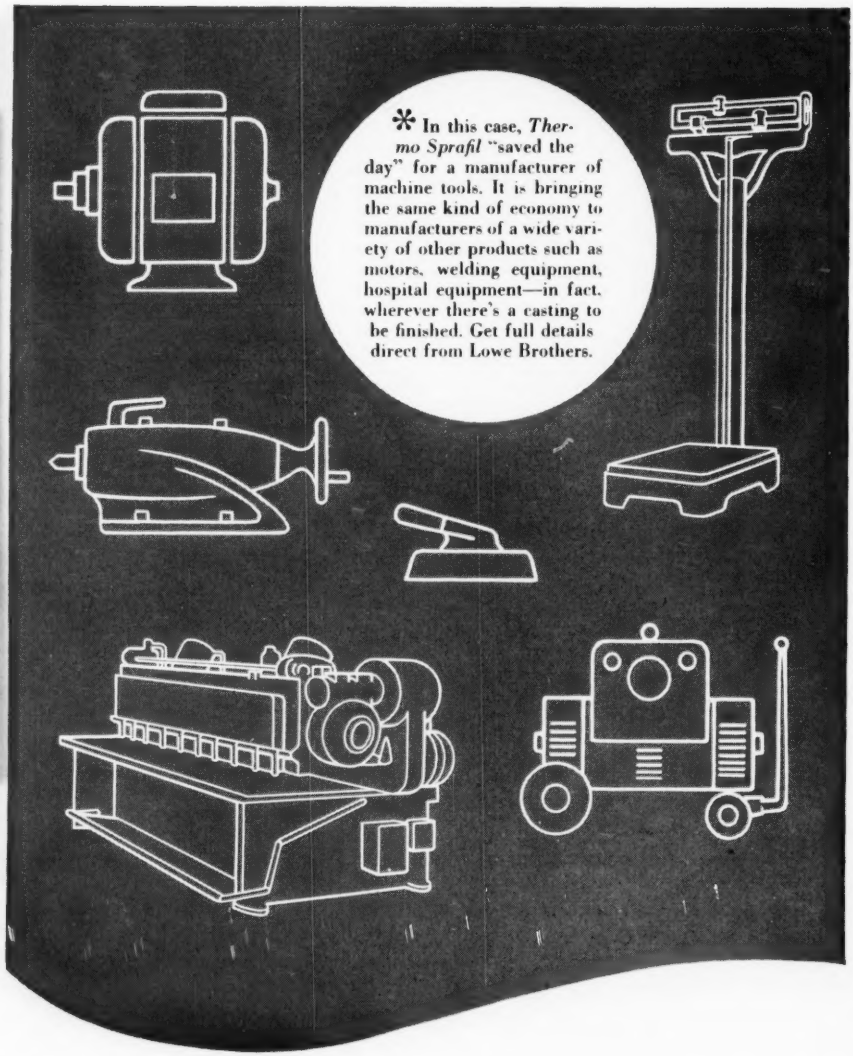
* In this case, *Thermo Sprafil* "saved the day" for a manufacturer of machine tools. It is bringing the same kind of economy to manufacturers of a wide variety of other products such as motors, welding equipment, hospital equipment—in fact, wherever there's a casting to be finished. Get full details direct from Lowe Brothers.

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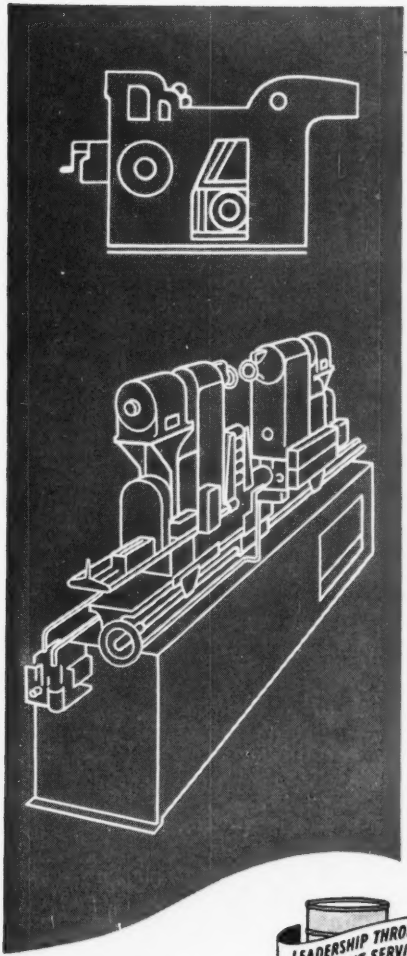

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Properties of Chromium Plate

By DR. ALLEN G. GRAY

IN addition to its well known decorative applications, chromium plating has many engineering uses which conserve labor and strategic materials. So called "hard chromium" plate has found wide application in machine elements. Because of its hardness and the ease with which it can be applied, manufacturers and maintenance shops have used it frequently for protecting softer metals from wear or for salvaging worn or undersized parts. The non-galling property of chromium plate is another important engineering advantage. The slickness and low coefficient of friction of chromium plate have many industrial applications. Chromium has good resistance to many corrosive environments. It also has good resistance to heat, being uneffected at temperatures at which many metals are rapidly oxidized. In many instances a combination of several of these properties and characteristics are important for successful commercial applications.

The unique combination of properties possessed by chromium plate makes it an important defense tool. These considerations led the Bureau of Aeronautics, Department of the Navy, request an investigation at the National Bureau of Standards of the effect of chromium plating on the plastic deformation and fatigue properties of steels used in aircraft. The results of this investigation have been recently reported

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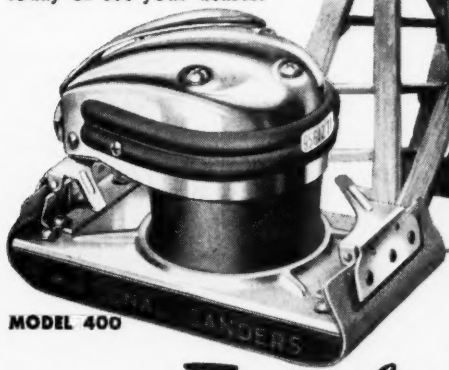

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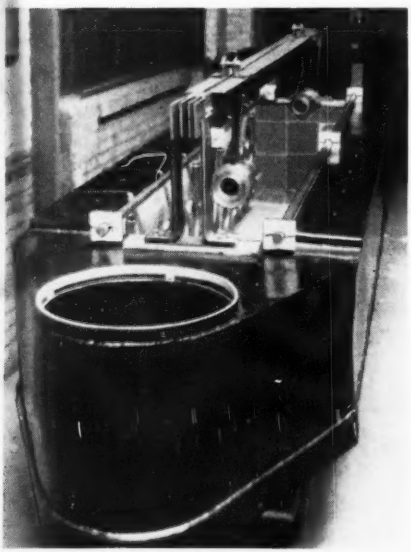
by Hugh L. Logan, in the Journal of Research of the National Bureau of Standards. Tensile, tensile impact, bending and crushing tests were used in evaluating the effects of chromium plating on the plastic deformation of the steel studied.

It is reported that chromium plate is used on such parts as steel bushings, hydraulic pistons, naval aircraft landing and catapult hooks, landing struts and pistons, brake rings, and aircraft engine cylinders. Hard chromium is also used on many of the tools and machines which are used to manufacture defense-essential supplies and equipment. Figure 1 is a view of a chromium plating setup.

The steel used by Logan in studies conducted at the National Bureau of Standards to determine the effect of

Fig. 1—Chromium plating tank, acid-proof ceramic brick-lined, and supplied with ventilation duct on two sides with collector box on one end. The tank also has a 6 per cent antimony-lead steam coil fitted with hanger.
(Photo courtesy Heil Process Equipment Corp., Cleveland 11, Ohio)



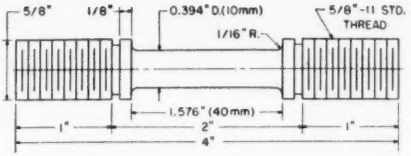


Fig. 2—Specimen for tensile impact tests conducted at the National Bureau of Standards on chromium plated steel in accordance with drawing prepared at the New York Naval Ship Yard.
(Illustration courtesy National Bureau of Standards, Washington 25, D. C.)

plating on plastic deformation consisted of one lot of SAE 4130 rod, ⅝-inch in diameter, and one lot of SAE 4130 tubing, having an outside diameter of 1½ inches and a ⅛-inch wall thickness. All specimens prepared from rod stock were rough machined, prior to heat treatment, to dimensions 0.015 to 0.020 inch greater than those of the finished specimens. These specimens and lengths of tubing for crushing tests were quenched from approximately 1600 deg. F. into oil. All material was tempered for 1 hour at 923 deg. F., and then cooled in air. Following the heat treatment, all specimens were machined to final dimensions.

Plating of test specimens was carried out in an electrolyte containing 250 g./l. of chromic acid and 2.5 g./l. sulfuric acid. The bath was maintained at 131 deg. F. and the current density used was 350 amp./sq. ft. In the course of the studies, specimens were tested as plated and after they had been plated and given various baking treatments. The tensile specimens were machined with diameters in the reduced section of 0.4375 ± 0.0010 inch and gage lengths of 2 inches. Thicknesses of 0.0001, 0.001, 0.010 and 0.015 inch in the conditions as plated and as baked were tested.

Tensile impact specimens were machined in accordance with the drawing shown in Fig. 2. The specimens were tested at the New York Naval Shipyard as machined, as plated to a nom-

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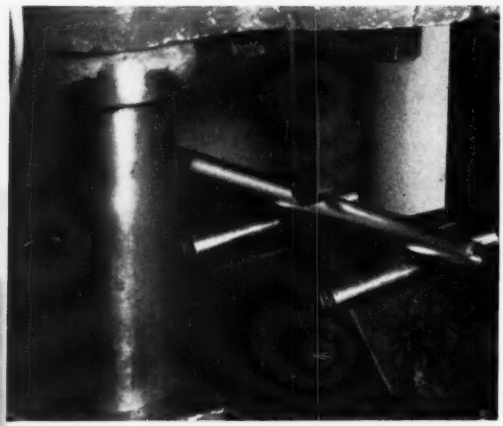

Fig. 3—Steel rod chromium plated at the National Bureau of Standards in position for bend test (supports 10 cm. apart).
(Photo courtesy National Bureau of Standards, Washington 25, D. C.)

inal thickness of 0.015 inch, and after various baking treatments. The tests were conducted at room temperature, the striking velocity was 27.8 ft./sec. The rod material used for bend tests was cut into 10-inch lengths. Specimens were ground and then plated to a nominal thickness of 0.015 inch. They were tested as plated and after various baking treatments in a hydraulic type testing machine, as shown in Fig. 3. Specimens for crushing tests were prepared from the steel tubing.

Effect of Plating on Mechanical Properties

The Bureau's studies showed that the most noticeable effect of chromium plating was to appreciably reduce the plastic deformation prior to fracture in all types of test except the tensile impact. The reduction of elongations in tensile tests was particularly noticeable. Tensile and yield strengths of plated specimens decreased as the plate thickness was increased from 0.001 to 0.015 inch. Data obtained showed that these properties, determined on specimens plated to a thickness of 0.015 inch, were 91 per cent or more of the corresponding properties of the unplated steel. The plastic deformation prior to fracture, in the tensile tests, became less as the plating thickness was increased. The tensile and yield strengths of the chromium plate were appreciably less than those of the steel base metal.

Logan pointed out that in making tensile tests on the specimens plated to thicknesses of 0.010 inch or more, it was noted that a part of the chromium spalled off the specimens just after the maximum load had been reached. During this part of the test, loads and cross sectional areas were changing extremely rapidly and neither loads nor specimen diameters could be accurately determined. Measurements of the reduced sections of these specimens at the conclusion of the test and after the remaining chromium had been stripped from the steel indicated that about 0.003 to 0.0035 inch of chromium remained on specimens originally plated to a thickness of about 0.010 inch. There was no appreciable spalling of chromium during tests from specimens plated to thicknesses of 0.001 and 0.0001 inch.

Logan's tests showed that baking of plated specimens for 6 to 8 hours at 392 deg. F. prior to testing produced substantial increases in the deformation properties over results obtained on plated but unbaked specimens. For specimens plated to thicknesses of 0.0001 and 0.001 inch, baking at 824 deg. F. produced greater increases in values of these deformation properties than were obtained by baking at 392 deg. F. For specimens plated to a thickness of 0.010 inch some improve-

to page 62→

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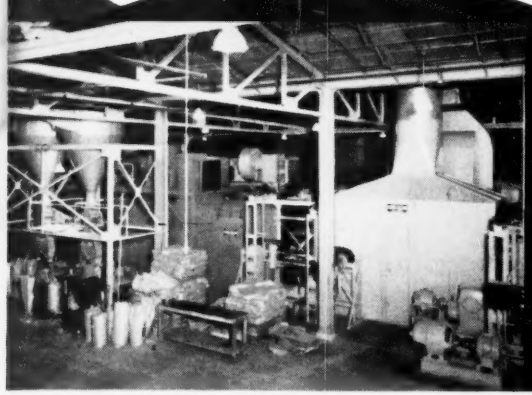

Dual Rock Wool Processing Lines; Ovens in left background and cooling tunnels at right. In left foreground is rock wool granule reclamation; particles are collected and bagged.

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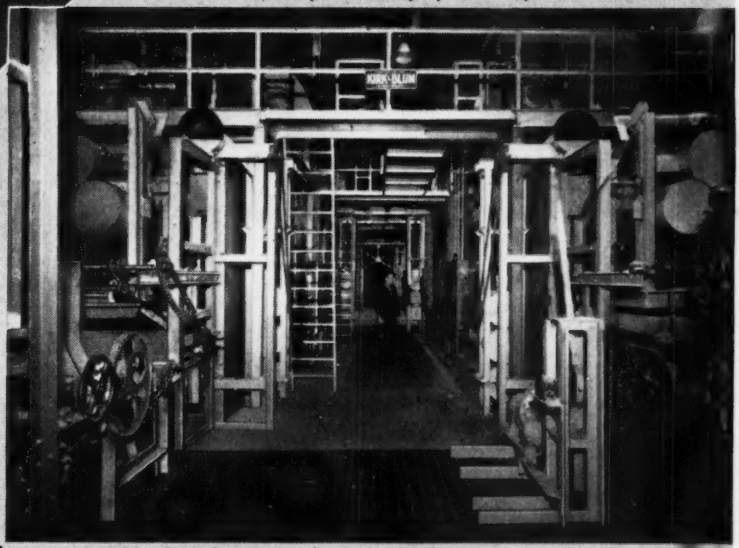

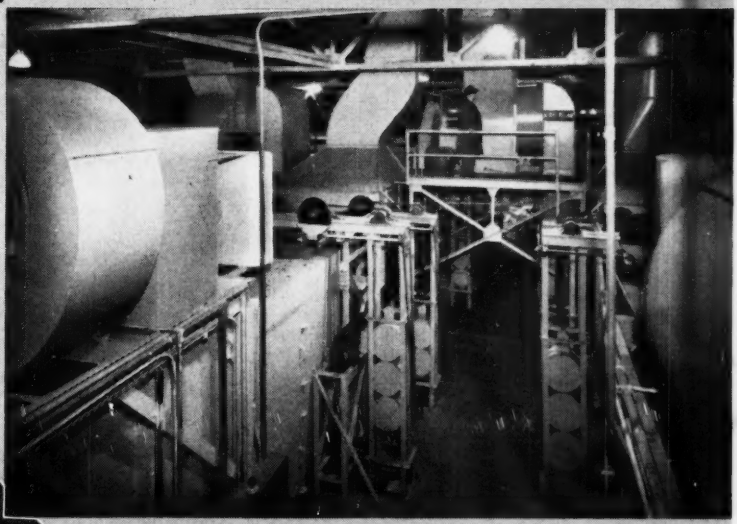

Air Heating and Handling Equipment; ovens are gas-heated, atmospheric air used for cooling.

ment was obtained in these properties by baking at 824 deg. F. for 1 hour, but this improvement was not as great as that obtained by baking at 392 deg. F. for 6 hours. It was postulated that greater improvement in these deformation properties might have been obtained by baking specimens with the 0.010-inch thick plate for a longer period at 824 deg. F., preferably in an inert atmosphere or protective bath. In general, the yield and tensile strengths of the plated specimens were not appreciably changed by baking.

Since the electrodeposition of chromium is, electrochemically, a very inefficient operation, Logan suggested that hydrogen deposited on the steel with the chromium may be a factor in reducing the amount of plastic deformation that the steel can withstand prior to fracture. Only 15 to 20 per cent of the current is effective in depositing chromium and large quantities of hydrogen are released at the cathode. It has been reported that 1 volume of chromium plate contains as much as 128 volumes of hydrogen. It is generally considered that hydrogen produces embrittlement in steel.

In the tests, atomic hydrogen was deposited on unplated tensile specimens by making them cathodes in a 10 per cent sulfuric acid solution. Specimens on which tests were begun approximately 1 minute after they had been removed from the bath broke before yield loads (0.2 per cent offset from the modulus line) were reached. The elapsed time from the removal of the specimens from the bath to their fracture was 6 to 8 minutes. Testing of one specimen was delayed for 5 to 6 minutes after it was removed from the solution and a true stress-true strain curve very similar to that of specimens tested as machined was obtained. These results thus indicate that the effects of depositing atomic hydrogen on a steel specimen are very transient.

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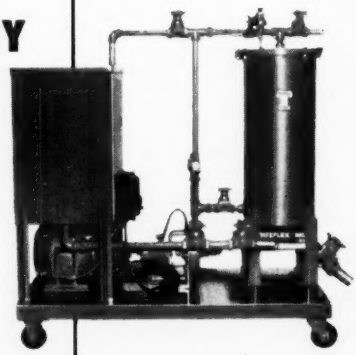

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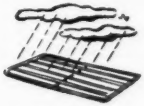
whether your product must be finished for corrosion  resistance, or paint adherence, or with eye-appealing brightness, or in a variety of attractive colors, there's an **IRIDITE** to do the job!

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In discussing these results Logan stated that it is difficult to see how hydrogen deposited on the steel during the chromium plating process would be retained unless there was diffusion from the chromium into the steel and a state of equilibrium was set up. If such a condition existed, baking of specimens at 392 deg. F., which is reported to expel approximately half of the hydrogen from the chromium, would be expected to decrease the hydrogen in the steel and hence increase the plastic deformation prior to fracture. Baking at 824 deg. F. is continued for a sufficiently long period, should remove more than 90 per cent of the hydrogen from the chromium and might be expected to further increase the plastic deformation that could occur in the base steel before fracture occurred.

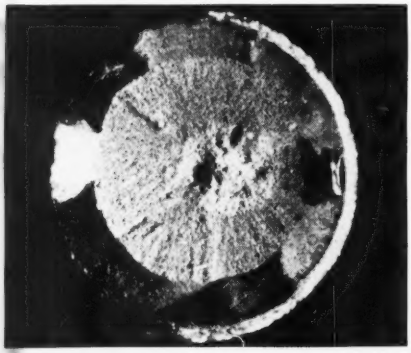

Fig. 4—End of fractured specimen plated to a thickness of 0.010 inch with chromium showing central spot differing in appearance from remaining area. No markings of this type were found in specimens baked before testing, or in specimens with thinner chromium plating, or in specimens loaded cathodically with hydrogen.
(Photo courtesy National Bureau of Standards, Washington 25, D. C.)

Tensile specimens plated to a nominal thickness of 0.010 inch, and broken without subsequent baking, showed areas near the center of the fractures that differed markedly in appearance from that of the remainder of the fractured surface. A typical area of this type is shown in Fig. 4.

Earlier work had been conducted by Logan at the National Bureau of Standards to determine the effect of chromium plating on the endurance limit of aircraft steels, the tests being conducted in the "as plated" condition and after heating. SAE X4130 and 6130 steels were used in the studies. The tests showed that the endurance limits of these steels was reduced by chromium plating. The endurance limit was found to decrease with increased hardness of the steel. The decrease in the endurance limit of the normalized steel, caused by chromium plating, was generally small; the minimum endurance limit of any group of plated specimens was 75 per cent of the endurance limit of the unplated steel. This value was obtained on specimens plated to a thickness of 0.001 inch at a current density of 1000 amp./sq. ft. Most sets of specimens had endurance limits ranging from 83 to 95.5 per cent of that of the unplated steel. Specimens plated in the bath at 131 deg. F. and a current density of 200 amp./sq. ft. had endurance limits equal to or greater than those plated at 158 deg. F. and 1000 amp./sq. ft. For steel of a given hardness (Rockwell 40-C), the reductions in endurance limit increased with increased plating bath temperatures.

In reporting the results of this related work, Logan pointed out that the endurance limits of test specimens plated, and subsequently surface ground, were equal to or greater than those of unground specimens having the same final plating thickness. Interruption of the plating process did not affect the endurance limit of the plated specimens, provided that proper precautions for plating chromium on chromium were taken before the plating was resumed. *to page 68→*

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COPPER, BRASS & BRONZE	BUFFING COMPOSITIONS, LIGHT OILS		MAT. 20W	NON-TARNISHING
DIE CASTINGS ZINC BASE	BUFFING COMPOSITIONS, LIGHT OILS	MAT. 20W	MAT. 30W	REVERSE CURRENT CLEANING
LEAD BASE CASTINGS	BUFFING COMPOSITIONS, LIGHT OILS	MAT. SOLVENT #1		
ALUMINUM ALLOYS	BUFFING COMPOSITIONS, LIGHT OILS	MAT. 20W	MAT. 20W	SHORT DIRECT CURRENT CLEANING, NON-ETCHING
ALUMINUM ALLOYS	BUFFING COMPOSITIONS, LIGHT OILS	MAT. 25		ETCHING
MAGNESIUM BASE CASTINGS	BUFFING COMPOSITIONS, LIGHT OILS	MAT. 50W	MAT. 50W	
GENERAL PURPOSE STEEL, BRASS, DIE CASTINGS	RUN OF THE SHOP	MAT. 30W	MAT. 30W	DO NOT USE ON ALUMINUM

The cleaners listed and briefly described above are the H-VW-M Cleaners most generally used by the industry. They are, however, only a part of H-VW-M's service in supplying the plating and polishing industry with essential cleaner requirements. The complete facilities of H-VW-M's modern laboratory are always available for the formulation of cleaners to meet specialized, individual needs.

It is this combination of the ability to fill promptly all ordinary needs, and to develop special products for extraordinary requirements, that makes up *Platemanship*. The metal finishing industry has learned from experience that H-VW-M can always meet and even anticipate requirements in every phase of pickling, polishing, buffing, cleaning, anodizing, and plating.

Bulletin C-106 gives details on the standard line of H-VW-M Cleaners.

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How to double Abrasive Belt productivity

SPECIAL SERRATIONS ARE THE SECRET

NEW "61"

SERRATED RUBBER

CONTACT WHEEL

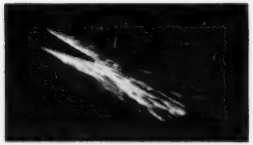
for Abrasive Belts

Glazing...the enemy of prolonged and productive belt life, is virtually eliminated when you use "61" contact wheels.

"61" WHEEL USERS ARE GETTING THESE DRAMATIC PRODUCTION RESULTS

Long-Life Cutting Action

Only the contact wheel is different in these two photos—same type of belt, same work, same surface speed, same camera exposure—but what a difference in cutting action!

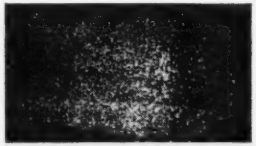


• Spark pattern at 24 minute mark using belt on standard serrated wheel.

• Spark pattern at 80 minute mark using belt on new "61" wheel.

Non-Glazing That's Amazing

Unretouched photos tell the story. Same belt—same work—different wheels. Imagine—the belt section pictured far right has already run more than *three times as long* as the other section—still has plenty of abrasive life left, still is unglazed!



• Glazing on belt after 24 minutes using standard serrated wheel.

• Non-glazing on belt after 80 minutes using new "61" wheel.

Adopt the new "61"—the revolutionary contact wheel pioneered by CARBORUNDUM and now in use for hundreds of abrasive belt applications on backstand, swing frame and wide belt grinders.

Special serrations in the "61" wheel face are designed to cause a controlled breakdown in the bond of the abrasive belt. This action reduces belt glazing so sharply that you get as much as *double the productive life* from each belt.

Get the whole story now—including cost-cutting case histories on work like yours—from your CARBORUNDUM man or distributor salesman. Or write Dept. PF 82-55.

The new "61" wheel, a CARBORUNDUM engineering development, is typical of the constant technical advances you can expect from CARBORUNDUM, the abrasives pioneer. Yes, the "61" will give you increased productivity from *any* abrasive belt, but if you're not now using belts by CARBORUNDUM, try one. The two go hand in hand.

Only CARBORUNDUM

TRADE MARK

offers ALL abrasive products...to give you the proper ONE

"Carborundum" is a registered trademark of The Carborundum Company, Niagara Falls, N. Y.

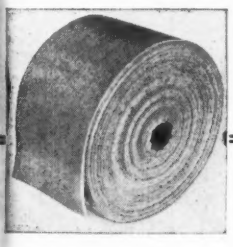
82-55

The endurance limits of specimens heated after plating and tested at room temperature reached a maximum value for a baking temperature between 374 deg. F. and 572 deg. F. Also, endurance limits of specimens heated for 1 hour at 824 deg. F. were significantly higher than those of the "as plated" steel. Reduction of the endurance limits of steel by chromium plating is believed to be due, in part at least, to residual tensile stresses in the chromium. Heating of the chromium increased its density and hence decreased its volume. It appears that heating at low temperatures increased the residual tensile stresses in the chromium plate. At sufficiently high temperatures, the concurrent contraction of the chromium plate and expansion of the steel stressed the chromium above its ultimate tensile strength, thus relieving some of the residual tensile stresses in the chromium and increasing the endurance limit of the plated test pieces.

Hardness of Chromium Plate

In discussing chromium plating for engineering uses before the Association of Iron and Steel Engineers a short time ago, R. M. Wick, Bethlehem Steel Company, stated that a quality of chromium plate that has been found quite satisfactory for engineering use has a hardness of approximately 825 Vickers Brinnell. Hardnesses above 1000 Brinnell have been obtained, but according to Dr. Wick, these are accompanied by an increased brittleness that limits the applicability in some cases. In connection with the wear of chromium plated surfaces, it has been noted that in many cases the wear of the opposing member is materially reduced, even though this member is not chromium plated, because of the tendency of chromium to "wear smooth."

It is possible to apply heavy chromium plate without fear of separation of the plate from the base metal even



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— A WARRANTY OF SATISFACTION IN EVERY CARTON —

A Platecoil has more heat transfer area than a pipe coil twice its size. Thus it takes only half as much Platecoil to heat a given area. You have 50% less steel to pay for so you can save nearly 50% in initial cost. The Platecoil takes only half as much space in the tank. The greater BTU transfer per unit area of Platecoil also means faster heating or cooling. Platecoils require less maintenance and can be removed without dumping the solution.

Send for complete technical manual and descriptive Bulletin No. P50.

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Division
KOLD-HOLD MFG. CO.
LANSING 4, MICHIGAN

Why Platecoils Cost Less

LOW FIRST COST

The initial cost of Platecoil is often 50% or more below the cost of equivalent pipe coil depending, of course, on the materials used in construction

EASY INSTALLATION

By the use of "quick change hangers" Platecoil installations can be made in open tanks in one-half hour or less by one man and a helper.

NO THREADED JOINTS IN TANK

The entire Platecoil is electric welded and pressure tested. There are no joints to corrode or leak. Both connections to the Platecoil can be located above the liquid level where there is no danger of thread corroding and freezing.

GREATER TANK CAPACITY

A 22" x 47" Platecoil gives the same heat transfer surface as 32 feet of 1½" pipe. This pipe requires a space approximately 30" x 60". Platecoil thus saves about 50% over equivalent pipe coil.

WEIGHS 50% LESS

Weighing only about half as much as equivalent pipe coil, Platecoil is easy to handle. A whole maintenance crew is not needed to transport and install Pipecoil.

TANK MAINTENANCE WITHOUT LOSS OF SOLUTION

There is no need for workmen to get inside the tank in order to make replacements or repairs. A Platecoil can be removed in a matter of minutes with the solution still in the tank.

LITERATURE

The new Platecoil Bulletin furnishes a complete description of the Platecoil method of tank heating. Write for your copy today.

HIGH BTU TRANSFER

More prime surface of Platecoil can be installed in a given area than can be obtained with pipe coil. Thus a more compact Platecoil unit provides much greater BTU transfer per unit area than can be obtained with pipe coil. Quick starts in heating tank solutions mean more hours of productive time.

Kold-Hold Manufacturing Company, Lansing 4, Michigan

under conditions of severe stress. Techniques for securing satisfactory adhesion between the chromium plate and the base steel are described in the ASTM recommended practice specification on chromium plating for engineering use. Dr. Wick emphasized the value of engineering chromium plating in maintenance practice in such applications as tools, gages, mis-machined parts, and wearing parts. A high current density-high temperature process was recommended. One of several acceptable baths of this type contains 275 g./l. of chromic acid and 5 g./l. of sulfuric acid, operating at a temperature of 158 deg. Fahrenheit.

Dr. Wick brought out the point that recent reports by various workers in the field have indicated that the physical properties of chromium plated at high temperatures are superior for mechanical use to that plated from low temperature baths. However, experience has shown that chromium plated from low temperature baths is adequate for many uses and the high current density chromium process referred to above permits the extension of chromium plate to applications where high stress concentrations may be encountered. In the high current density-high temperature chromium plating process, the chromium has been found to have a hardness of about 825 Vickers Brinnell. While it is possible to plate chromium much harder than this, according to Dr. Wick, it usually involves the sacrifice of a quality that might be termed toughness. Since in this range of hardness the load penetration curve is so steep, it might be postulated that differences in hardness number in this extreme range is of lesser significance than proportionate differences in the lower range of hardness.

* * *

Factors Affecting The Quality of Lacquer Coatings

THE presence in a spray lacquer of extra-fast-evaporating solvents may lead to blushing of the coating in humid weather, and to various manifestations of poor "flow," such as orange peel, dry-spray, and overspray. These defects in the character of organic finishes applied to metal products are objectionable because they detract from the decorative quality of the finish.

Due to the fact that a finished nitrocellulose lacquer is compounded of various solvents, diluents, plasticizers, resins, pigments, and nitrocottons, the choice of these materials and the proportion in which they are employed depend on the use for which the lacquer is intended as well as on the allowable cost of the finished lacquer. In such complex mixtures no one component is responsible for good per-

to page 74→

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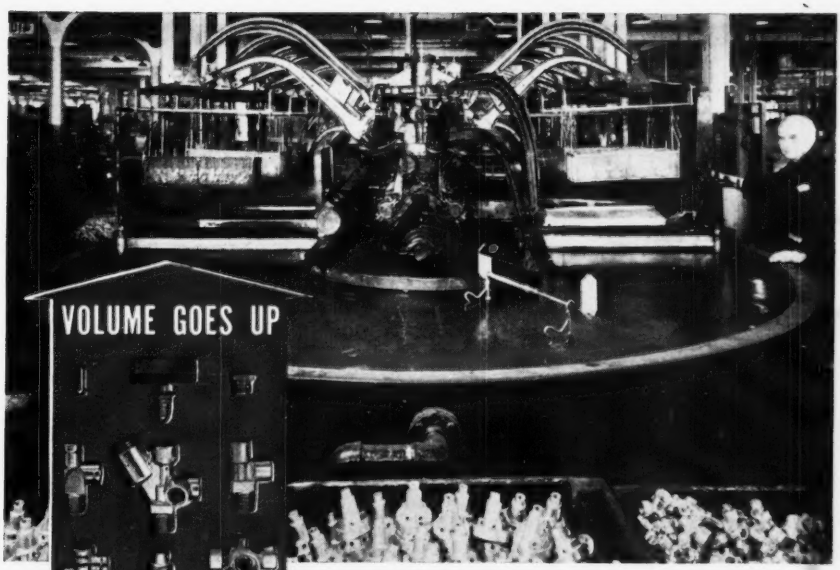

Stevens Full Automatic at Bastian Blessing's Chicago plant used for processing valve parts shown in inset.

When a Stevens Automatic Goes To Work . . .

Look at the results reported by The Bastian Blessing Company of Chicago, after installing a Stevens Special Full Automatic Bright Dipping Machine!

E. N. Krein, vice president, says: "Although our Stevens Machine has been in operation only three months, it has demonstrated its advantages in so many ways that *we wish to confirm the claims made by Stevens about this equipment!* Parts sent through this machine without prior cleaning come out *dependably and uniformly bright and free from grease, dirt and chips.* We have *increased our volume and reduced our unit costs* on our bright dipping operations. The installation is doing a big job in this day of labor shortages and it is doing it without the fumes and personal protective equipment of the past."

Why don't you let a Stevens representative show you how Stevens equipment can bring new profit and economy to *your* operations? Call him today or write direct to *Frederic B. Stevens, Inc., Detroit 16, Michigan,* for information.

METAL FINISHING EQUIPMENT AND SUPPLIES SINCE 1883

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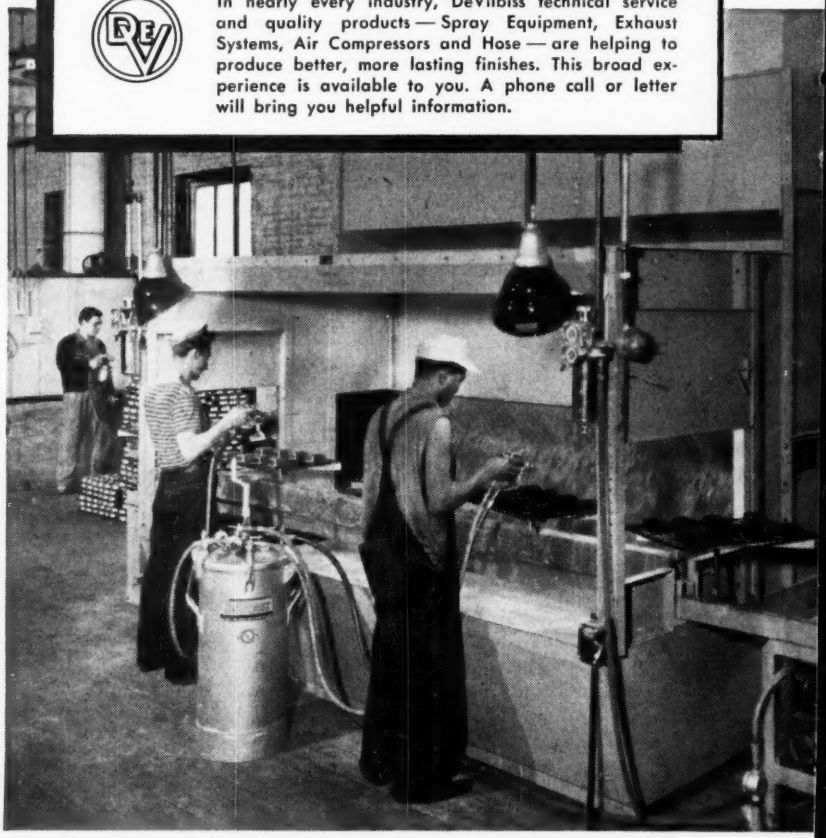
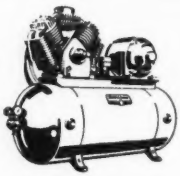
It's the teamwork that pays off

In nearly every industry, DeVilbiss technical service and quality products — Spray Equipment, Exhaust Systems, Air Compressors and Hose — are helping to produce better, more lasting finishes. This broad experience is available to you. A phone call or letter will bring you helpful information.



This DeVilbiss conveyorized finishing setup helps small-parts manufacturer spray-paint hundreds of parts per hour.



Air Compressors

Hose and Connections

Spray Guns

How to spray hundreds of small parts per hour and save money

This shop turns out a great variety of small metal stampings by the thousands. Painting was a big problem. Often it was a serious bottleneck.

Then, the owner called in DeVilbiss. The attractive installation you see pictured at left was installed. It consists of a DeVilbiss water-wash spray booth, chain-on-edge conveyor, spray guns, hose, air transformers and paint tanks.

Parts to be painted are placed on wire trays. Spray operators paint tops and sides of parts, rotating the trays manually as they pass through the spray booth.

Compared to former methods, parts are now finished much faster, considerably better and at a lower unit cost. Improved finishing techniques like this are typical of the benefits you get with DeVilbiss service and quality products.

If you're troubled by finishing department bottlenecks, or if you would like expert advice on finishing problems, phone our nearest branch office or write us. We welcome the opportunity to serve you.

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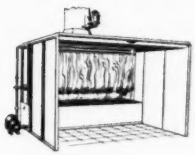

Spray Booths

FOR BETTER SERVICE, BUY

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formance but proper balance of all constituents is of prime importance. As a result, the choice of a lacquer solvent involves consideration not only of its ability to dissolve nitrocellulose but also of its influence on the other ingredients and on the performance of the lacquer as a whole.

Data recently made available* by Shell Chemical Corporation show that three types of blush may be encountered with nitrocellulose lacquers; namely, moisture, hydrocarbon, and resin. Generally speaking, the term blush resistance refers to resistance to moisture blush since this type is most frequently encountered. Moisture blush is caused by the deposit and retention of undesirable quantities of water during the application and drying of the lacquer film. Other factors such as temperature and application technique have some effect on this type of blushing; however, the relative humidity of the atmosphere is the most important factor. Hence, it is possible, while maintaining other factors constant, to use humidity as a criterion for classifying active solvents with regard to their blushing tendencies.

In general, it will be found that a rapid rate of evaporation signifies poor blush resistance due most likely to the cooling effect and subsequent precipitation of moisture. Although low-boiling solvents themselves do not exhibit particularly good blush resistance, they may be incorporated in considerable proportions in a complete lacquer formulation without markedly reducing the blush resistance, since the other major components, such as diluents and medium-boiling active solvents, promote good moisture resistance.

Blushing is evidenced by whitened films or white spots in the finish. The very rapid evaporation of the volatiles

* Technical Publication SC:50-2, "Methyl Ethyl Ketone." Shell Chemical Corporation, New York.

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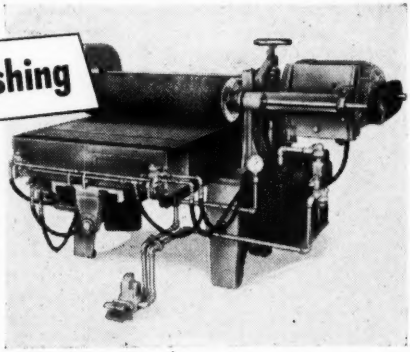

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HOT Lacquer NEWS

PUBLISHED PERIODICALLY BY HERCULES POWDER COMPANY IN THE INTERESTS OF BETTER FINISHES AND FINISHING

Calif. Ford Dealer Gets Better Finish With One-Coat Lacquer Hot-Sprayed

Ellsworth Harrold Co., Sacramento, Standardizes on Hot-Spraying Method

The Ellsworth Harrold Co. of Sacramento, California, veteran Ford dealer, has proved the advantages of hot-spraying lacquer for complete finishing jobs . . . with *only one coat* for the entire job.

A typical job, shown on this page, was done in 35 minutes total spraying time, using 60 pounds pressure per square inch and lacquer temperature of 180° at the pot.

Ray McCurdy, paint shop foreman for Ellsworth Harrold, says, "Hot-spraying of lacquer is the answer to year 'round automobile refinishing in hottest summer days or cold, damp winter days."

When asked for specific advantages of hot lacquer, Mr. McCurdy added:

Eliminates blushing . . .

Single coat application equivalent to multiple coats cold application . . .

Standard lacquers can be used with hot-spray thinners . . .

No waiting . . .

No lost time . . .

Excellent gloss without rubbing or polishing . . .

No overspray to bother other cars . . .

Minimizes *lifting* of old finishes . . .

Eliminates heat lamps and bake ovens . . .

Eliminates *flowering* of metallic colors . . .

No shop tie-ups for drying . . .

Accidental mars easily corrected . . .

Gives *expensive* looking finish.

(Right) — Completely stripped Ford gets hot-spray lacquer

(Below)—Completed job—one coat — 35 minutes spraying time.

NEW MILITARY LACQUER SPEC.

A new military specification for lacquer is now issued and official. Identified as "Military Specification MIL-L-11195 (ORD) Lacquer, Lustreless, Hot Spray (For Ammunition)." Hercules will send you full information on hot lacquer, types of heating equipment available, and the performance record of hot lacquer in many industries.

HERCULES POWDER COMPANY
INCORPORATED
Cellulose Products Department
927 Market Street, Wilmington, Delaware

CL51-17R

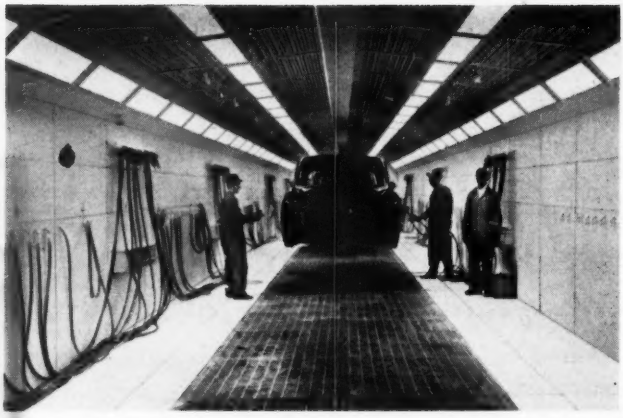

Fig. 5 — A "downdraft" hydro filter spray booth for finishing automobile bodies constructed by the R. C. Mahon Company.
(Photo courtesy The R. C. Mahon Co., Detroit 34, Mich.)

in the spray cone and in the drying film causes them to cool below the dew point of the air around them, thereby precipitating minute quantities of water in the lacquer. It can be readily seen that during the drying of the film, the evaporation and escape of this deposited water is greatly hampered by high humidity conditions, while that of the solvents and diluents continues at its normal pace. The proportion of water in the film therefore increases continuously to a point beyond its solubility in the lacquer. This excess of water emulsifies with the lacquer, and thereby produces a discontinuous film which scatters the rays of light, appearing white. The nitrocellulose is not actually precipitated in the blushing process; however, to the finishing man there is very little difference whether the blushing phenomenon is one of precipitation or emulsification, as the whitened, flattened (low gloss) appearance, and very low adhesion of the blushed film makes it objectionable in either case. Figure 5 shows a modern "downdraft" hydro filter spray booth for finishing automobile bodies while Fig. 6 shows a typical spray finishing setup for smaller products.

Data have been presented to show that hygroscopic alcohols, if employed in large proportions, have an unfavorable effect on blush resistance even though these alcohols may have considerable lower rates of evaporation than the active solvent. By increasing

Fig. 6—A typical setup for spray finishing an industrial part with a tough organic coating.
(Photo courtesy The DeVilbiss Co., Toledo 1, Ohio)

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TO MEET GOVERNMENT SPECS.

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MIL-C-5541 USA-57-02C

For other Gov't Specs., write for Specification Data Sheet

Prep-n-Cote

Multi-Purpose, Corrosion-Resisting, phosphate coating and cleaning product for mechanical cleaning systems . . . Described in Prep-n-Cote Bulletin 48-91.

Metalprep

General all-purpose Rust Remover and Metal Cleaner, available in wipe-off and dip type grades . . . Described in Metalprep Bulletins 50-34 and 50-37.

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Corrosion-proof Coating for Aluminum Alloys, providing thousands of hours of salt spray and humidity resistance . . . Described in Lyfanite Bulletin 49-98.

Galvaprep

Provides greater paint adhesion on Galvanized Iron, Galvanneal and other zinc-coated surfaces . . . Described in Galvaprep Bulletin 48-89.

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Heavy Rust and Light Scale Remover; non-corrosive on surrounding equipment . . . Described in Prep-Pik-L Bulletin 49-3.

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Economical process to preserve Ferrous Metals from rusting during fabrication and interim storage periods . . . Information on request.

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General all-purpose Metal Conditioner for Aluminum Alloys, available in wipe-off and dip grades . . . Described in Alumiprep Bulletin 50-62.

Emulsoprep

Emulsion and Alkaline Metal Cleaners, available for all types of metals and applications, dip or spray . . . Described in Emulsoprep Bulletin 50-61.

. . and General PREP Bulletin 48-60

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the resin proportion of a lacquer and consequently the solids concentration, improved resistance to blushing may be obtained.

When 25 per cent of the methyl isobutyl ketone in a lacquer formulation containing 30 per cent solids is replaced with methyl ethyl ketone, the blush resistance is reduced from 83 to 82 per cent relative humidity. At this same solids concentration, when the only active solvent present is methyl ethyl ketone, the blush resistance is about 73 per cent relative humidity. A similar relationship holds for 20 and 10 per cent solids lacquers. Because a lacquer with blush resistance in the range of 70-80 per cent relative humidity is usually adequate, tests have shown that sizeable quantities of fast-evaporating solvents such as methyl ethyl ketone may be included in a lacquer formulation without reducing the blush resistance to a point where it is likely to cause difficulty under normal application conditions.

Orange peel is generally thought to be due to poor flow characteristics since it is caused by the inability of the moist lacquer to level out and to automatically eliminate the imperfections of surface caused by the method of application. The degree of the orange peel type of defect depends a great deal on the speed of evaporation of the volatiles because spray application deposits the lacquer on the surface in the form of small globules and clusters of such globules, and the sprayed material must be kept fluid for a sufficient time to allow these globules to flow together into a smooth continuous film. Thus, lacquers containing large proportions of the rapidly evaporating solvents may dry up too rapidly to allow this flowing-together process to complete itself. Variations in the technique of spraying may also influence the final smoothness of sprayed lacquer films.

* * *

Pickling and Etching Aluminum Alloys

THE oxide film left on aluminum alloys after heat treatment, welding, casting and forging can be conveniently removed by pickling in acid solutions. Typical pickling solutions used in England (summarized in Table I) are described by V. F. Henley in a recent discussion of surface treatment of aluminum which appeared in "Light Metals." The sulfuric-chromic acid solution, according to Henley, has a dual application; immersion for a short time removes oxide film from aluminum with scarcely any attack on the underlying metal. However, by prolonging the time to 30 minutes, a slight attack on the metal occurs and the surface obtained is an improved base for painting. The phosphoric acid-

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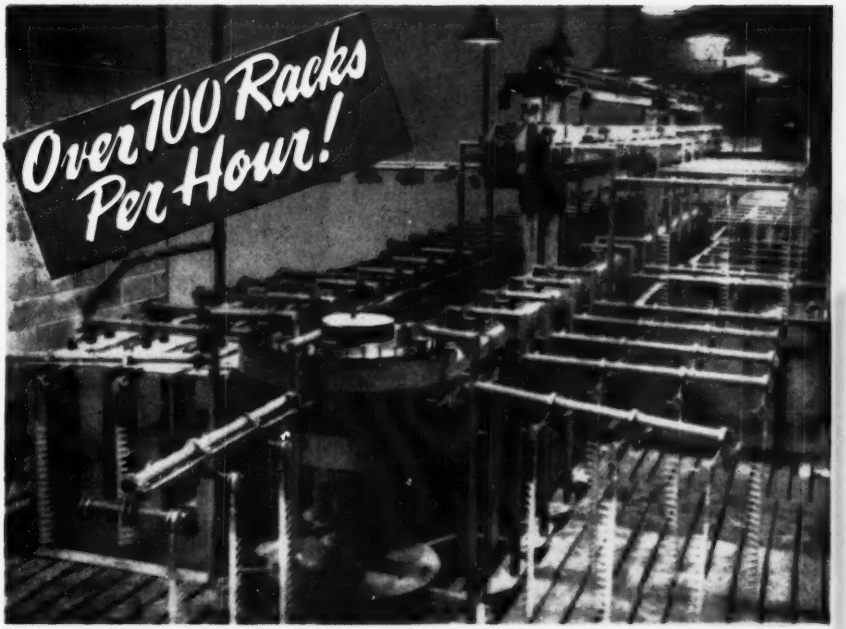
Standardize on DETROIT HANDY "TAC" RAGS and stop losses due to rejections. Specify "DETROIT" for removing all particles of dust, lint and sand. Try this modern method today. Order from your supplier at once, or send for sample.
DETROIT HANDY "TAC" RAG
DETRO MFG. & SALES CO., INC., CULVER CITY, CALIF.



Lasalco's VERTICAL-LIFT FULL AUTOMATIC

Floor Area, Only 74' x 15'

Another production-boosting, profit-making installation by Lasalco:

- Now used for anodizing, the above equipment can be easily arranged for plating by a simple, quick and inexpensive conversion.
- Driving power for the entire machine is hydraulic. The elimination of speed reducers and all excessive mechanism results in much lower maintenance cost.
- Only two operators, to load and unload, can maintain maximum production.
- In plating work using several acid dip tanks, or in anodizing work requiring two or more dye tanks, selective operation is easily arranged to permit either the use or bypassing of one or more tanks.

From all available information this machine is the fastest producer ever installed in so small a floor space—74' x 15'. If you want to expand production and reduce operating and unit costs, Lasalco engineers will be happy to give you complete details and discuss your problems without obligation.

Racks shown in illustration are 24" long, 4" wide, 3" thick.

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Table I

ACID PICKLING SOLUTIONS FOR ALUMINUM ALLOYS

COMPOSITION	TEMPERATURE DEG. F.	TREATMENT TIME
(I) Sulfuric acid (Sp. gr. 1.84) 15% by volume Chromic acid 5% by weight	212	Up to 30 min.
(II) Phosphoric acid (Sp. gr. 1.72) 5% by volume Chromic acid 3% by weight	212	3 min.
(III) Sulfuric acid (Sp. gr. 1.84) 10% by volume Hydrofluoric acid (40% HF) 2% by volume	Room	3 min.
(IV) Nitric acid (Sp. gr. 1.42) 75% by volume Hydrofluoric acid (40% HF) 25% by volume	Room	½ - 3 min.

(Courtesy "Light Metals")

chromic acid pickle has so little effect on the metal that it is a suitable reagent for estimating the weight of oxide films by the chemical stripping and weighing method.

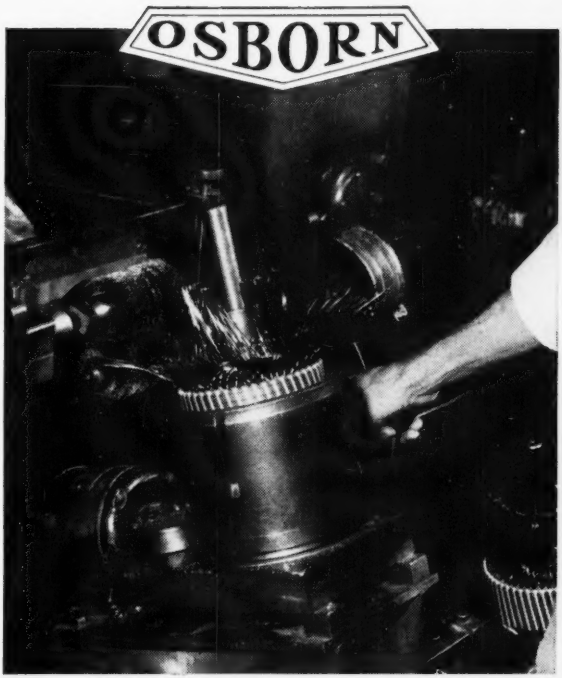
Sulfuric acid-hydrofluoric acid mixtures slowly attack aluminum; however, such solutions are generally preferred to caustic soda for stripping imperfect anodic films. Equivalent amounts of sodium fluoride or potassium bifluoride can be used instead of the hydrofluoric acid. Sand cast aluminum may need to be cleared of embedded sand particles by a dip in a nitric-hydrofluoric acid pickle. This mixture reacts rapidly at room temperature but the action may be moderated by increasing the proportion of nitric acid and reducing the water content of the mixture.

Alkaline Etching

Aluminum differs from magnesium and from most other metals in the readiness with which it is attacked by alkaline solutions. These etching processes are used for producing varied degrees of matte finishing on wrought aluminum and less frequently on cast products. According to Henley, a solution of 2-5 per cent caustic soda at a temperature of 160 deg. F. is commonly used to produce light to medium etching. For deep etching a solution consisting of 4 per cent caustic soda with 2 per cent sodium fluoride was recommended. A solution consisting of 4 per cent caustic soda and 0.05 per cent copper (added as cuprammonium sulfate) is used for etching of high purity aluminum. After etching, it is important that parts be rinsed, followed by a dip in 20 per cent by volume nitric acid, then rinsed again in alkali-free water before the next operation.

Bright Dipping

In recent years, processes have been developed for producing bright surfaces on aluminum alloys. In view of the initial cost of acid solutions for this



How to make parts come clean . . . at the push of a button

It takes only 8 seconds to remove the enamel insulation from the entire bunch of a motor's coil leads with the set-up shown above. This stripping, preparatory to soldering, is done with Osborn power brushing . . automatically . . at the push of a button.

Wire stripping is typical of thousands of cleaning operations throughout Industry which have been simplified and speeded by Osborn Power Brushes. Your **O**sborn **B**rushing **A**nalyst is experienced in finding solutions to cleaning and finishing problems of all kinds.

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Osborn Brushes

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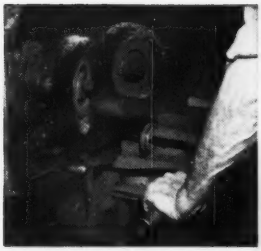
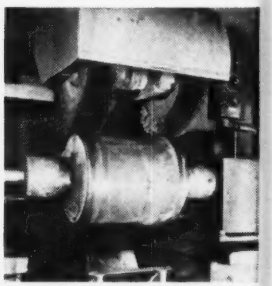


OFF COMES RUST. These two counter-rotating Osborn Master® Wire Wheel Brushes, powered by 1½ h.p. motors, clean rust and scale from 2-inch pipe preparatory to fabrication. Cleans 15 feet of pipe per minute . . . at the push of a button.



OFF COMES SLAG. It takes only 40 seconds for these Osborn Wire Wheel Brushes to whisk away all slag and scale from both end welds of compressor heads . . . at the push of a button.

OFF COMES FLASH. Removal of rubber flash of rubber-to-steel joints of army tank track shoes is simply a matter of sliding the shoes across the face of an Osborn Disc-Center* Wire Wheel Brush. A mass production operation . . at the push of a button.

*Trademark

Table II

ACID SOLUTIONS FOR BRIGHT DIPPING ALUMINUM ALLOYS

	COMPOSITION		TEMPERATURE OF OPERATION DEG. F.
	CONSTITUENT	CONCENTRATION	
(I)	Sulfuric Acid (Sp. gr. 1.84)	50% by volume	194 - 230
	Phosphoric Acid (Sp. gr. 1.72)	50% by volume	
(II)	Sulfuric Acid (Sp. gr. 1.84)	30% by volume	194 - 230
	Phosphoric Acid (Sp. gr. 1.72)	70% by volume	
(III)	Sulfuric Acid (Sp. gr. 1.84)	25% by volume	
	Phosphoric Acid (Sp. gr. 1.72)	70% by volume	194 - 212
	Nitric Acid (Sp. gr. 1.42)	5% by volume	
(IV)	Phosphoric Acid (Sp. gr. 1.72)	70% by volume	
	Acetic Acid (Glacial)	25% by volume	194 - 212
	Nitric Acid (Sp. gr. 1.42)	5% by volume	

(Based on data from "Light Metals")

purpose they are not generally used for descaling, but rather for brightening surfaces that have already received some form of surface preparation such as sandblasting or alkaline etching. The brightened surfaces can either be clear lacquered or protected by anodic oxidation. Various solutions suggested by Henley for this purpose are given in Table II.

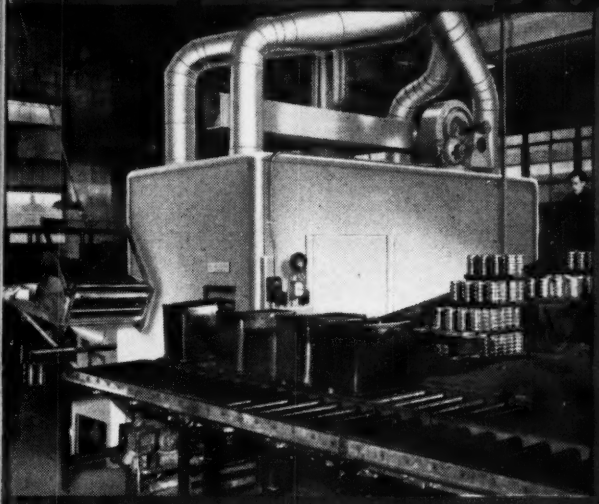
The production man may be confronted with two special problems in cleaning aluminum alloys unless proper processing methods are used. One of these is the removal of smut on the surface after alkali etch cleaning, especially in the case of alloys containing silicon. Although all of the metals normally found in the aluminum smut will be removed by combinations of nitric and hydrofluoric acids, a sequence involving, first, a dip in nitric acid and then in hydrochloric acid cannot be used. The nitric acid dip will remove all metals except silicon. Then when the metal part is dipped in a hydrofluoric acid solution to remove silicon, further etching of the base aluminum will occur to re-form copper smut. Thus, it is necessary to use combinations of nitric acid and hydrofluoric acid to produce completely clean surfaces. One mixture that has been recommended* consists of three volumes of nitric acid and one volume of 48-52 per cent hydrofluoric acid.

Another problem may arise due to

* This composition was suggested by Dr. Walter R. Meyer, Enthone, Inc., in discussing Cleaning and Etching of Aluminum Alloys before the 98th meeting of the Electrochemical Society.

intangible benefits

Pay-off!



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Oil coated parts, 15 tons every 24 hours, are drained, washed with soluble oil, blown-off and dried. At the same time, in another section of the machine, the racks and pans are cleaned, ready to receive the clean parts.

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the formation of etch patterns on aluminum surfaces that are contaminated with heavy oil or grease if they are immersed in a hot alkaline cleaner without proper precleaning. This etch pattern develops due to the fact that uniform removal of the grease film may not be accomplished and deeper etching will occur in the regions where the oil is first removed. An acceptable form of solvent precleaning to remove most of the heavy oil will suffice to prepare the surface for etch cleaning with alkalies. This will minimize the danger of etch patterns.

* * *

Primer Is Important In Protective Paint Coatings

IMPORTANT among the materials used for preventing corrosion are protective paint coatings. Corrosion inhibitive paints, or primers as they are sometimes called, depend principally upon the inclusion of a corrosion inhibitive pigment to keep the metal surface in a non-corroding state. In discussing the importance of primer coatings, as a part of a discussion on preventing corrosion with protective paint coatings in a recent issue of "Corrosion," George Diehlman and E. L. Beenfeldt, National Lead Company, pointed out that red lead is the best known corrosion inhibitive pigment and the one with the longest record of successful performance. It is used as the sole pigment or in combination with other pigments incorporated in a suitable binding medium or vehicle. The choice of vehicle is generally determined by the environmental conditions of intended exposure and the surface condition of the metal to be protected. Red lead is included in many of the metal protective paint specifications of the Federal Government as well as

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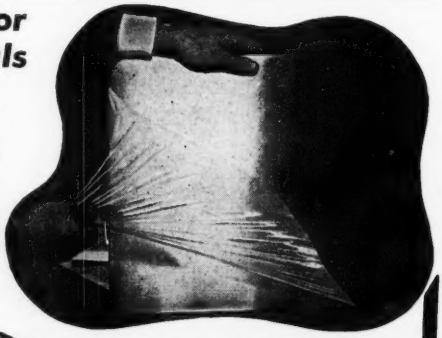

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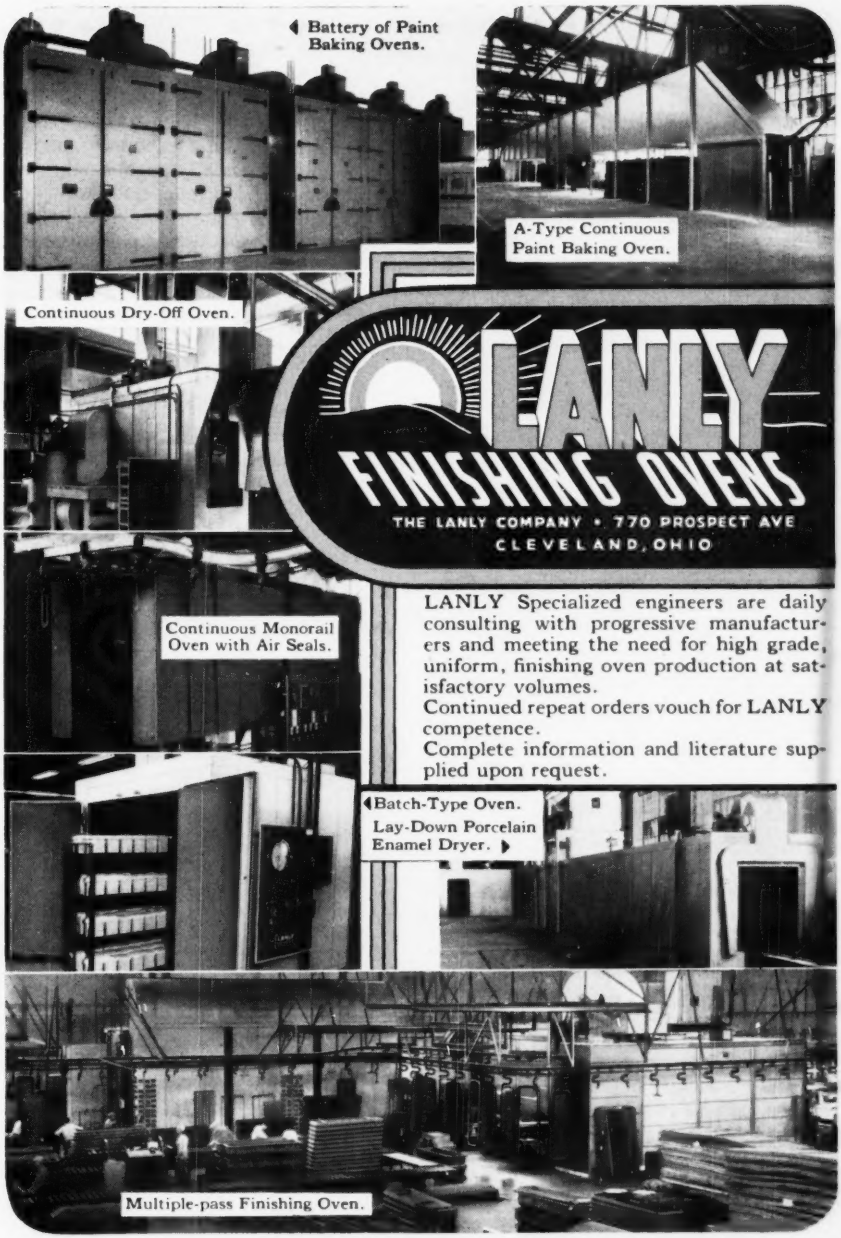
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those of city, state, and industry associations.

The protective performance of a paint system is dependent upon two main functions: its ability to shield the metal from the corrosive environment; its ability to inhibit corrosion when the destructive environment does permeate the film. The vehicles or film forming portion of the paint must be such that they will be stable under the environmental conditions of exposure and adaptable to the method of application. Increasing the film thickness of the coating, particularly by the use of multiple coats of paint, will result in a proportionate decrease in permeability and an increase in protective life.

The ability of paint coatings applied at practical thickness to completely exclude the environmental factors responsible for corrosion is limited. Variations may be due to such factors as film impermeability characteristics, porosity, film thickness, and breaks caused by damage. This emphasizes the second important function which a protective coating must possess; namely, the ability to inhibit corrosion. Inhibition is imparted through the inclusion in the priming coats of corrosion inhibitive pigments. All types of vehicles may be used with red lead to meet general service conditions and drying speed requirements. The priming paint must be formulated to provide not only adequate corrosion inhibitive properties but also to possess good penetrating and bonding characteristics so that it will adhere tenaciously to the base metal and provide a sound foundation for subsequent paint coats.

Typical protective paint systems for steel structures cited by Diehlman and Beenfeldt were as follows:

1. Atmospheric exposure—two coats of red lead-linseed oil paint or two coats of red lead-synthetic resin (straight or modified with raw linseed oil) followed either by one

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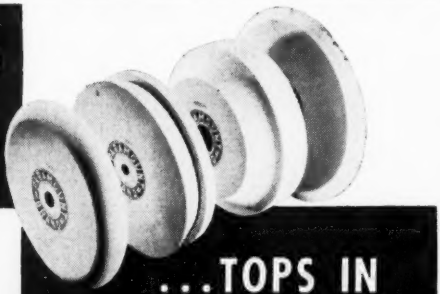
FELT WHEELS



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Ohio Systems are not standard fit-all systems. They are designed and engineered to meet your individual requirements. Ohio engineers, thoroughly experienced in their field, make a careful, exacting survey of your plant and an analysis of conditions and then plan the system that will meet most efficiently your special needs and conditions.

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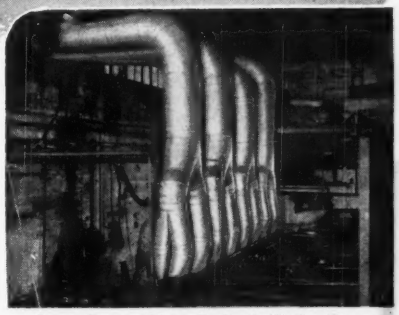
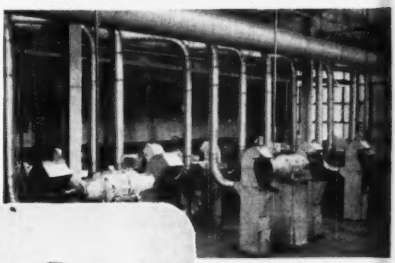
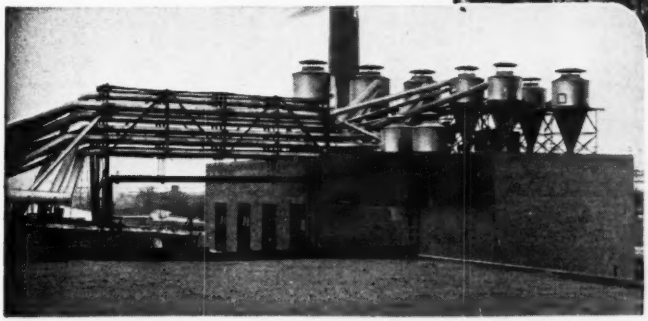


Fumes Removal Installation in Plating Room



Dust Collecting System for Buffing Machines



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or two finish coats utilizing a similar type of vehicle.

2. Fresh water immersion or humid atmospheres — red lead-phenolic (or phenolic modified vehicles) or red lead-vinyl compositions for primer followed by finish coat of similar vehicle.
3. Saline or sea water — systems based on vinyl resins or properly balanced coumarone-coal tar combinations using red lead as the corrosion inhibitive constituent.

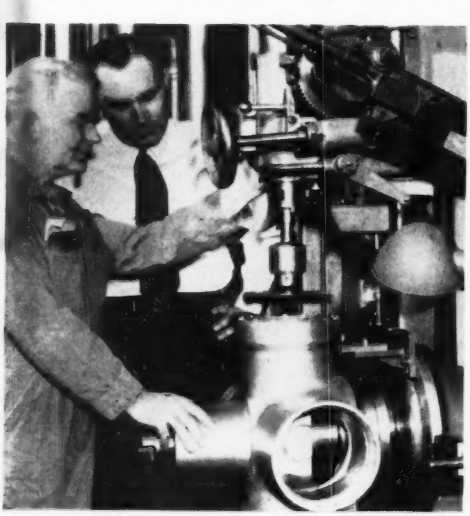
Mechanism of Inhibition

In discussing the mechanism by which red lead functions as such a valuable inhibitor on outdoor painted steel, U. R. Evans cites several viewpoints in his book "Metallic Corrosion, Passivity and Protection." According to Evans, tests have shown that the mere presence of lead in a pigment is no guarantee of inhibitive power. Other studies have suggested that inhibition shown by metallic lead and some of its oxides may be due to the formation of a solution of lead hydroxide which becomes absorbed at the steel surface. However, other investigations have recorded lead peroxide as a doubtful inhibitor. Experiments conducted with litharge, red lead, and metallic lead have shown, in general, that they render water non-rusting provided sufficient time was allowed for the pigment to dissolve before the iron was introduced. Presumably, it was the hydroxide which constituted the true inhibitor.

The view that protection by red lead is largely due to its passivating power, while that conferred by iron oxide is essentially mechanical, has been confirmed by measurements of the fluctuation of electrode potential of iron buried in or coated with these two compounds. Also, Evans has pointed out that the possibility that oxides of lead act simply as adsorption inhibitors has not been ruled out. Another reason

---

BY converting a drill press into a high-speed production brushing machine, the Propeller Division of the Curtis-Wright Corporation saved nearly $20,000 in equipment and time getting into production on an operation vital in the manufacture of its variable pitch propellers.



With the help of power brushing specialists from the Osborn Manufacturing Co., Cleveland, Ohio, engineers worked out a method for removing the particles of fragmented metal and smoothing peaks left on the diameter of a shot-peened hub bearing area.

An Osborn wire brush was mounted on a drill press equipped with an air-operated ram and timer. The propeller hub is placed in a holder on the drill press. After the machine is actuated, the automatic timer runs the brush through the cycle. The brush, which runs at 900 r.p.m., is lowered into the hub to the depth necessary to contact the bearing surface. After brushing the shot-peened area, the brush is lowered and raised to clean the threaded portion. The result is a highly finished product.

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for the effectiveness of red lead as a pigment in metal primers has been attributed to the inhibition of the anodic solution of steel or iron due to its alkaline and oxidizing nature. This property is very important particularly in the acid conditions of industrial environments. In addition, it may react with oil to form relatively insoluble soapy materials which reinforce the film, making it more impervious to moisture. The characteristic inhibitive properties of red lead can also be used to advantage in combination with both reactive and inert pigments.

* * *

Mechanical Finishing Offers Advantages for Magnesium Parts

PRECISION tumbling, as a finishing process, offers several important advantages to manufacturers using magnesium parts. According to the Dow Chemical Company, modern methods of mechanized tumbling effect substantial finishing cost reductions on magnesium products by greatly reducing the need for hand labor. Such batch processing methods are drawing special attention in many plants and shops because they hold the most promise for reducing finishing time and establishing other economies, especially on small parts. Many hand operations can be eliminated in connection with such operations as deburring, trimming flash, polishing and buffing.

One type of tumbling technique that has been applied to magnesium parts is a process employing wet mixtures of compounds and chips developed specifically for this method, which can be used on castings, forgings, stampings and machined parts. Tumbling processes employing steel balls can also be used to produce a final bright finish.

According to information available on the "Roto-Finish" process, two types of tumbling chips are used. Grinding chips are used for grinding and deburring operations. They are fairly large-size chips which provide a faster cutting action but leave a rougher surface than smaller, slower-cutting chips. Various sizes of chips in different combinations are employed in plants doing tumbling finishing operations. Chips are also available for producing a smooth, lustrous surface. Steel balls or other highly polished steel coloring media are used whenever a final bright finish is desired. In

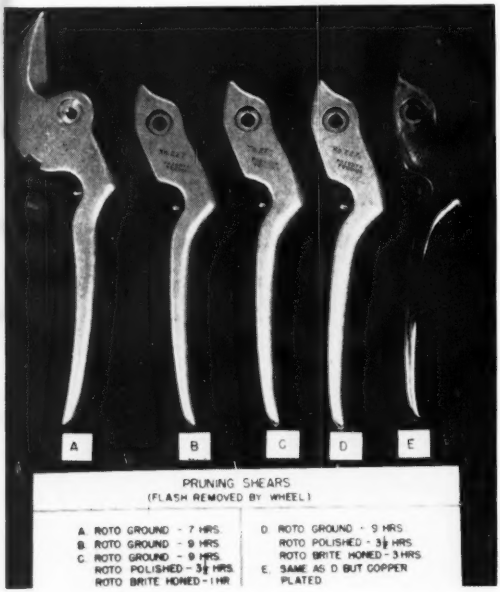
A
B
C
D
E
PRUNING SHEARS
(FLASH REMOVED BY WHEEL)
A. ROTO GROUND - 7 HRS.
B. ROTO GROUND - 9 HRS.
C. ROTO GROUND - 9 HRS.
ROTO POLISHED - 3½ HRS.
ROTO BRITE HONED - 1 HR.
D. ROTO GROUND - 9 HRS.
ROTO POLISHED - 3½ HRS.
ROTO BRITE HONED - 3 HRS.
E. SAME AS D BUT COPPER PLATED

Fig. 7—Pruning shears of magnesium finished by barrel tumbling methods.
(Photo courtesy Dow Chemical Company, Midland, Mich.)

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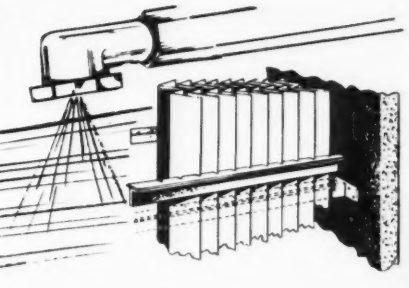

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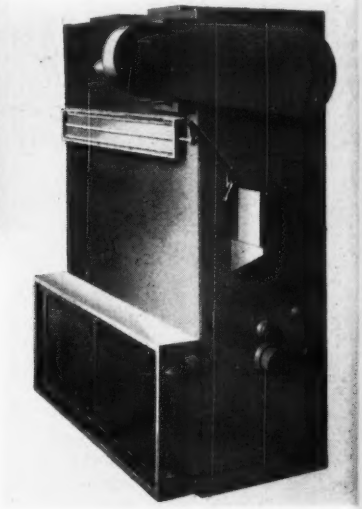

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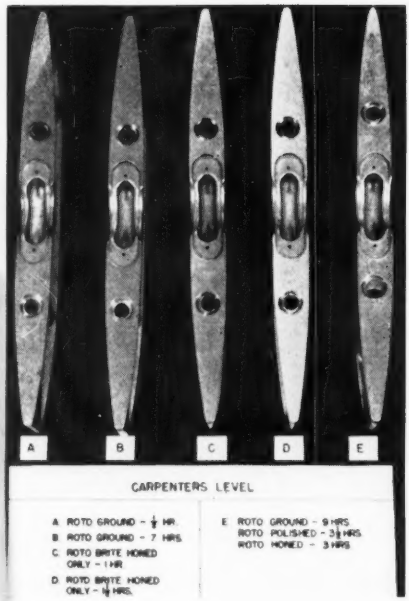


Fig. 8—The results of using various tumbling methods on a series of carpenter's levels of magnesium.
(Photo courtesy Dow Chemical Co., Midland, Mich.)

all "Roto-Finishing" processes, the work and processing chips are used with water to which certain recommended compounds are added to increase the cutting power of the chips. In general, the type of chip and compound used depends upon the type of part being finished; such factors as size of parts being polished, degree of luster desired, and number and location of openings in the work are factors that enter into this selection. Figure 7 and Figure 8 illustrate the application of tumbling methods to finishing of magnesium.

To give a final bright finish on magnesium parts after the previous steps have been carried out, steel ball coloring may be used. This type of tumbling process tends to peen the parts rather than cut or grind them; thus, it does little to cover any surface defects in the metal. The bright tumbling mixture, which is alkaline, is added in sufficient quantity to cover both magnesium parts and steel balls with a 3 to 4 inch layer of the solution. The mixture is rotated hot for a sufficient time to produce the required luster. Figure 9 shows typical results obtained by steel ball burnishing of magnesium parts. Various conventional methods are used for drying.

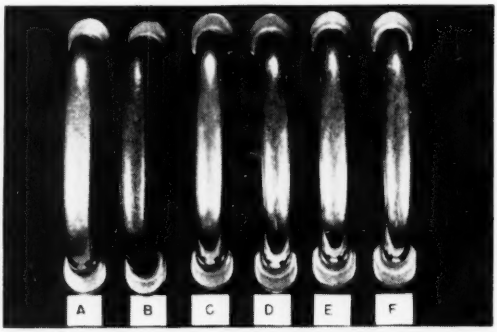
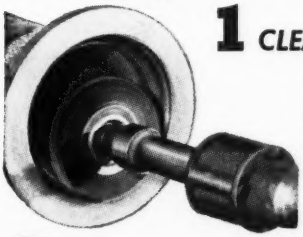

A
B
C
D
E
F
STEEL BALL BURNISHING OF MAGNESIUM PARTS
A. SURFACE BEFORE BURNISHING
B. 4 OZ OF WYANDOTTE'S 25 DR BURN POWDER HOT WATER-1 HR
C. 4 OZ OF CAUSTIC FLAKE WARM WATER-1 HR
D. 4 OZ OF CAUSTIC FLAKE 4 OZ OF SOAP FLAKES WARM WATER - 45 MIN.
E. 4 OZ CAUSTIC FLAKES 4 OZ SOAP FLAKES 1 OZ $Na_2CrO_4 \cdot 5H_2O$ WARM WATER-45 MIN.
F. 4 OZ SOAP FLAKES 1 OZ $Na_2CrO_4 \cdot 5H_2O$ WARM WATER - 45 MIN
TYPE BBL. - OCTAGONAL APPROX. 4CU FT. R.P.M. 26
STEEL BALLS - APPROX. 100 LBS.
40% - ⅜ BALL CONES
60% - ⅜ ROUND BALLS
5 GALS. WATER USED. BBL. HARDWOOD LINED
PARTS DRIED ON SCREEN OVER STEAM HEATER.

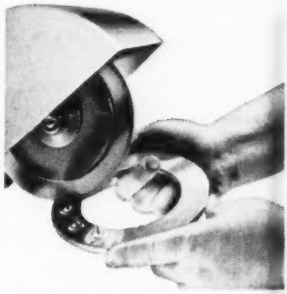
Fig. 9—Typical results obtained by steel ball burnishing of magnesium parts.
(Photo courtesy Dow Chemical Company, Midland, Mich.)

Pittsburgh Brushes Solved these Problems!



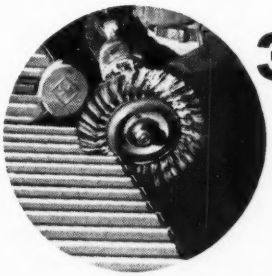
1 CLEANING RED-HOT CASTINGS in 30 seconds!

A Pittsburgh brush answered U. S. Pipe and Foundry's problem of cleaning red-hot castings. This rugged brush works 40 hours a week, turning out thoroughly cleaned castings at the rate of one every 30 seconds . . . a speed record for any brush cleaning operation of this type.



2 POLISHING 10,000 heating units!

When the Edwin L. Wiegand Company wanted to remove ragged edges from their *Chromalox* Heating Units economically and *fast*, they turned to rough, tough Pittsburgh Brushes for the answer. The 6" Pittsburgh steel wire brushes they installed polish 10,000 heating units during their life.



3 CLEANING WELDS in close quarters!

Allis-Chalmers' problem was to find a brush narrow enough to fit between cooling fins of transformer radiators, yet strong enough to remove slag and spall on welds which could conceal pressure-reducing pinholes. Pittsburgh engineers recommended an 8" rotary wire brush. Problem was solved!

Let Pittsburgh Engineers Solve Your Brush Problems.

Pittsburgh's complete line of brushes of every type, for every purpose, will provide a practical and economical solution of any brush problem you might have. Drop us a line on your company letterhead for a copy of our new booklet that shows, through actual case histories, how Pittsburgh can help cut your brushing operation costs. Address: PITTSBURGH PLATE GLASS COMPANY, *Brush Div.*, Dept. W-6, 3221 Frederick Ave., Baltimore 29, Maryland.

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PRACTICAL APPLICATIONS of Modern Products

Infra-Red Lamps at Work

By CARL E. EGELER
Engineering Division
General Electric Company
Cleveland, Ohio

INFRA-RED radiation has been a topic of widespread interest in many fields; however, the heating of industrial products by the energy from infra-red lamps is one of the larger applications and one which takes on tremendous importance during the current national emergency.

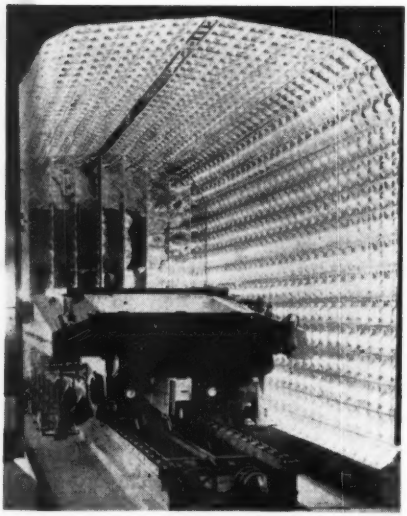

Fig. 1—Armored vehicles get a fast, effective paint-drying treatment in a New York arsenal.

Advantages of Infra-Red Lamps for Baking, Heating, and Drying

Important reasons for widespread acceptance of infra-red lamps as the energy source for baking, heating, and drying throughout industry include:

1. It does a quality job.
2. Transfers heat rapidly. No warm-up period. No "standby" expense while not being used.
3. Operates efficiently. Heats the product, not the air.
4. It is adaptable to conveyorized production methods and to products of unusual shapes. The versatility of the infra-red lamp makes it practical for a variety of applications which vary all the way from the drying of washed potatoes to the curing of the finish on tanks.
5. Saves factory space, as compared with some other heating methods.
6. Saves strategic materials. Lamps are mostly glass; their filaments use a minimum of critical metal in producing heat. When reflector lamps are used, no auxiliary metal reflectors are required.
7. Produces uniform results which, in turn, mean fewer rejects.
8. Has maintenance advantages. Lamps have long life (average

laboratory life in excess of five thousand hours). Lamps are easily replaced.

9. Offers economy in initial costs, installation, and upkeep.

How Infra-Red Works

The reason that infra-red lamps produce heat instantaneously is that the filament, being of a very small mass, heats immediately and radiates the energy from the filament directly to the product and, by absorption, this energy is quickly converted to heat within the product itself.

Materials which are good absorbers of infra-red radiation and which are good conductors of heat are particularly well adapted to heating by infra-red lamps. Mirror-like surfaces are likely to reflect most of the radiation, while matte or rough surfaces may absorb it. Since this is true, major consideration must be given to the absorption properties of the material to undergo processing so that the effectiveness of the installation may be determined before the equipment is actually installed.

Design Factors

The proper design of an infra-red application involves many factors. It is, therefore, desirable in most cases to contact a reputable oven manufacturer who will design a "prescription" oven to best furnish the heating cycle required for the product. There are many similar ovens, but no standardized designs are advocated due to the many variables involved, such as the type and color of finish, size, shape, and mass of material processed, as well as mechanical limitations as to size, weight, and shape of oven to be used. All of these and other factors must be considered in the prescription design of an infra-red oven installation.

Thus, complete laboratory testing facilities for individual product analysis are necessary to properly design an infra-red oven as the fundamental data should be supplemented by time and temperature determinations to complete a satisfactory design. Oven manufacturers have established such testing

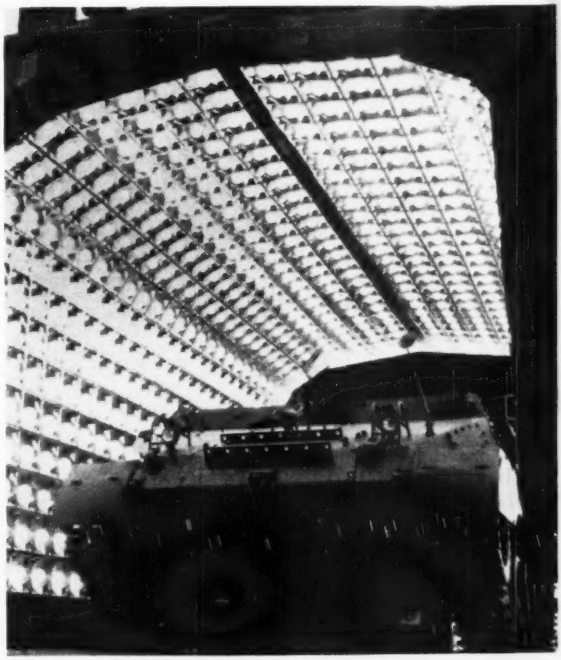

Fig. 2—At Red River Arsenal in Texas, vehicles for the U. S. Army are moved directly from the paint room to this infra-red oven, in which the paint baking job is completed in 20 minutes.
(*Official Department of Defense Photo*)

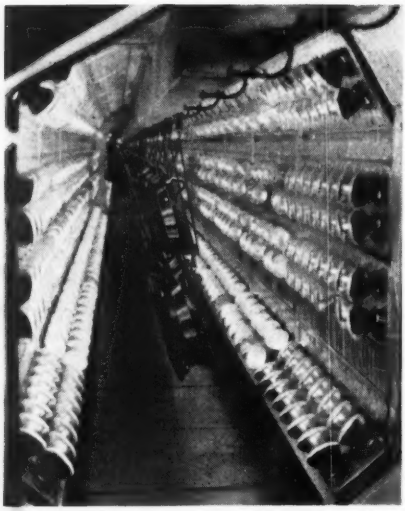

Fig. 3—Baking paint on wheels at Lincoln-Mercury plant.

laboratories for analysis of the customer's particular product.

New Uses for Infra-Red

The infra-red lamp, while still a relatively recent addition to the lamp picture (being introduced at about the same time as the fluorescent lamp), is opening almost daily new uses in industrial heating, baking, and drying.

Its low initial cost as well as its low operating cost for many installations, particularly where the heating cycle is intermittent and it is possible to turn off the energy when not needed, make it very attractive to progressive plant managements.

In other applications where infra-red lamps are used, the power cost may be somewhat higher than for an equivalent amount of heat supplied by a cheap fuel, but lower overall costs are still obtained. This is due to such factors as interest on the investment, low maintenance, flexibility, and other considerations, such as space, weight, availability, and so on. Good engineering of infra-red ovens is resulting in an energy cost comparable to other heating because of better utilization of the generated heat.

Good Temperature Control with Lamps

Control of product temperature, another advantage of infra-red lamp heating, is simple because the radiant energy output of an incandescent lamp

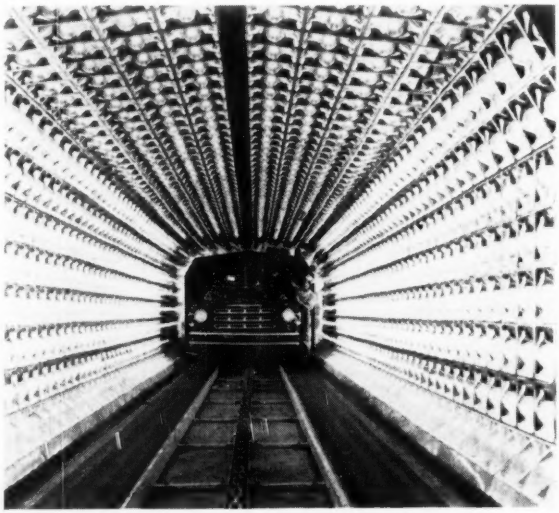

Fig. 4—Finish coat on Studebaker trucks is baked 14 minutes in the 44-foot infra-red oven shown here. After a final assembly finish inspection, any finish defects noted are touched up and baked in the same time cycle used for the regular finish coat baking process.

Look who's sporting a halo!

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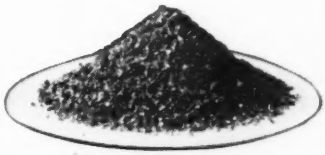

Bulletin ESA 198 describes Borolon grain in every type for top results on every polishing operation. Let's send it to you, together with the name of your nearest Simonds distributor. Write today.

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depends directly on the amount of wattage that is put into the lamp. It is quite easy to control the output by either using lamps of different wattages or by varying the voltage input to the lamps used, or both.

With infra-red lamps it is possible to supply high intensities of radiation so that the rate of energy transfer is sufficient to obtain the optimum results in the process.

Illustrative of the wide variety of uses for infra-red lamps, a number of installations now in use are shown in the accompanying pictures—they may suggest other places where infra-red lamp ovens could prove an advantageous solution to a drying, heating, or baking problem.

In addition to the varied applications shown in the photographs accompanying this article, there are literally thousands of others. One manufacturer of oven equipment reports that it has more than 6,000 customers using infra-red lamp ovens in processing several hundred different products.

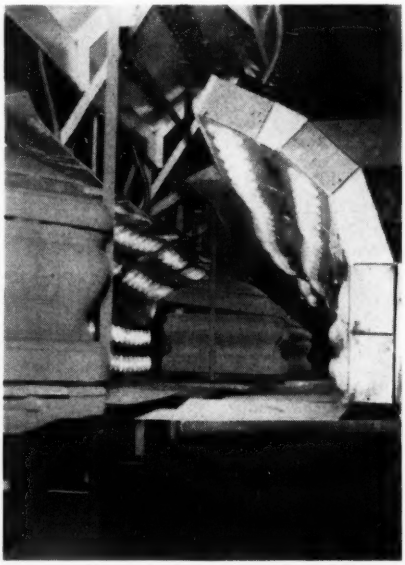

Fig. 5—Metal caskets are painted and dried under infra-red lamps at Ryan Aeronautical Company's plant in San Diego, California.

(Some of the photos for this article were furnished through the courtesy of the following manufacturers of oven equipment using infra-red lamps: Fostoria Pressed Steel Corp., Fostoria, Ohio; Jensen Specialties, Inc., Detroit, Mich.; Triangle Equipment Co., Inc., Nutley, N. J.)

(Adapted for PRODUCTS FINISHING from an article in "The Magazine of Light," and printed by permission of the General Electric Company, Schenectady, New York.)

To offset the widespread opinion that porcelain enamel will crack or chip from steel before the yield point of the base metal is reached or exceeded, some porcelain enamelers have devised spectacular demonstrations. One such demonstration uses an automatic hammer that delivers and records thousands of blows to a porcelain enameled surface with no effect.

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NEWS of the Industry

NEW PLANTS

The **PENNSYLVANIA SALT MANUFACTURING COMPANY OF WASHINGTON** has completed construction and begun operations of its plant at Portland, Oregon, for production of industrial cleaners, believed to be the first basic producer of its kind on the West Coast.

The plant will manufacture a complete line of specialty metal cleaners for a variety of metal-finishing operations, including electroplating, enameling, painting, galvanizing, fabrication and assembly, aluminum anodizing and etching.

The new plant embodies the latest production techniques and equipment. Improvements include accurate quality control devices, packaging and handling equipment and the usual equipment for comfort and safety of production employees.

Packaging operation at Pennsalt's new industrial cleaner plant in Portland, Oregon

COMPANIES

ARMOUR RESEARCH FOUNDATION OF ILLINOIS INSTITUTE OF TECHNOLOGY is offering approximately fifteen industrial research fellowships in physics, chemistry, metallurgy, ceramics, engineering mechanics, and electrical engineering to begin in September 1952. Those persons awarded fellowships will attend Illinois Institute of Technology half-time and work in the Research Foundation half-time in a graduate program leading to advanced academic degrees. They are employed full-time by the Foundation during the summer.

Awards are made on a competitive basis to U. S. citizens under 28 years of age holding a bachelor's degree from an accredited engineering or scien-

tific school or liberal arts college with a major in one of the appropriate sciences.

Application forms may be obtained from the Office of Admissions, Graduate School of Illinois Institute of Technology. Applications received prior to March 15 will be given first consideration.

The combination of **SHARPLES CHEMICALS INC.** with the **PENNSYLVANIA SALT MANUFACTURING COMPANY** through an exchange of common stock has now been effected, George B. Beitzel, Pennsalt president, has announced.

For the present Sharples will continue to operate as a separate unit of Pennsalt, with, however, an exchange of technical information and coordination of some policies to the mutual benefit of both organizations.

Field service representatives from the Cleveland, New England, New York, and Philadelphia sales divisions of **OAKITE PRODUCTS, INC.**, manufacturer of specialized cleaning materials, convened for a series of technical-sales conferences at the Hotel Statler in New York City on November 29-30 and December 1. Featured subject of these discussion meetings was the major role that cleaning and allied procedures must play in helping industry meet increased defense and civilian production requirements. Also heard were reports from Oakite research chemists, service engineers and technicians on new developments in cleaning and related materials soon to be made available to industry.

Similar conferences were held in San Francisco and Cnicago during November.

Under the auspices of the Economic Cooperation Administration, 18 members of the Netherlands Electroplating Productivity Team visited **GERITY-MICHIGAN CORPORATION'S** main plant at Adrian, Michigan, on December 4. Gerity-Michigan is one of the largest independent electroplaters in the field of decorative chrome trim.

The purpose of the visit of the team was to study the factors which result in the high productivity and improved quality of products attained in correlated industries in the United States. On their return to Holland they will report on their findings and make such recommendations as can be applied toward increasing the efficiency of their own industry.

The formation of two wholly-owned subsidiaries of **THE DOW CHEMICAL COMPANY** was announced recently by Dr. Mark E. Putnam, executive vice president of the parent company.

The two companies, Dow Chemical Inter-American Limited and Dow Chemical International Limited, represent a move to extend Dow's international activities. The former will handle the parent com-

View of the service representatives who attended the Oakite annual technical sales conference in New York City

pany's business affairs in Mexico, Central and South America, and the West Indies, while the latter will perform similar functions in Europe, Asia, Africa, and Australia.

Identical officers and directors were named for the two new firms, headed by Clayton S. Shoemaker, Dow's former Eastern sales manager, as president. Howard R. Ball, former export sales manager, will be sales manager of the subsidiaries, and William R. Clulo, former accounting supervisor, has been named treasurer and assistant secretary.

Mr. Shoemaker said the firms would make their headquarters in Midland and that personnel of the present export sales department would help staff the new organizations.

The formation of a General Electric Company Chemical Division product department to be known as the **SILICONE PRODUCTS DEPARTMENT** has been announced by Robert L. Gibson, general manager of the Division. Simultaneously it was announced by Mr. Gibson that Dr. Charles E. Reed, engineering manager of the Chemical Division, has been named general manager of the newly formed department.

With the formation of the Silicone Products Department, having headquarters in Waterford, New York, the G-E Chemical Division is now made up of four product departments, the other three being Plastics, Chemical Materials, and Laminated and Insulating Products.

Formerly included as products manufactured by the Chemical Materials Department, Mr. Gibson stated that the formation of a separate department to produce silicones was made desirable by the rapidly expanding silicone business.

It was recently announced by **THE BUCKEYE PRODUCTS COMPANY**, Cincinnati, Ohio, that arrangements have been concluded for a licensing agreement with Industrial Chemical Products, Ltd., Pty., Johannesburg, South Africa, whereby they will manufacture the complete line of Speedie Buffing and Polishing Compositions.

All Speedie Compositions will be available in both South Africa and the Rhodesias in accordance with the agreement which was concluded in the general offices of The Buckeye Products Company between Charles Wise, secretary, and Alexandre Lorant, director, who made a special trip to Cincinnati during his recent visit to this country.

Another patent has been issued to James A. Bede, president of **BEDE PRODUCTS, INC.**, Cleveland, Ohio, covering the company's line of industrial paint heaters. The patent, No. 2,576,588, covers the dual use of aluminum as a heat transfer agent and as an explosion-proof housing for the heating elements. The use of aluminum is said to provide a heat transfer agent far more efficient than water or other liquids.

NORTON BEHR-MANNING OVERSEAS INCORPORATED has formed a sales-distributing company in Mexico, Herbert A. Stanton, president, has announced.

Known as Norton Behr-Manning, S.A. de C.V., the company is located in Mexico City where it will supervise the sales and distribution of Norton Company,

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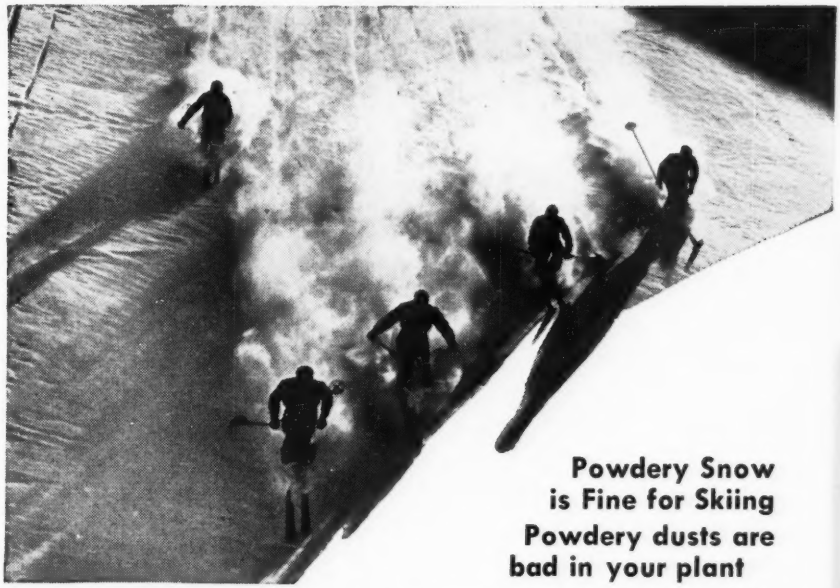

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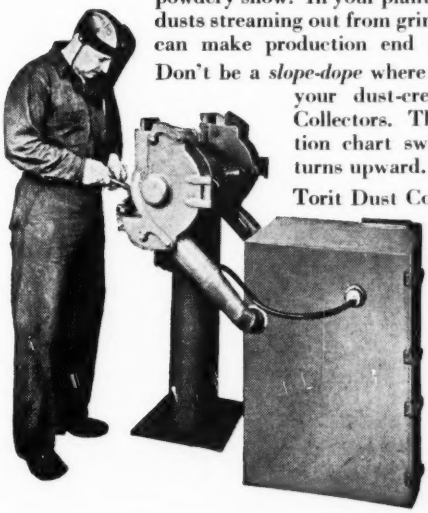
You can *shuss* along at a great pace when skiing down a slope of powdery snow. In your plant, however, the powdery and abrasive dusts streaming out from grinding, polishing and cut-off machines can make production end up in a bone shattering *sitzmark*. Don't be a *slope-dope* where your plant is concerned. Equip all your dust-creating machines with Torit Dust Collectors. Then watch the line on your production chart swing into a beautiful *telemark* as it turns upward.



Torit Dust Collectors are available in models and sizes for most industrial installations, and special adaptations can be quickly fabricated. Write today for complete information and the latest Torit catalog.

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Behr-Manning Corporation, and Norton Pike Company products throughout Mexico. Adequate stocks of grinding wheels, abrasives, polishing grain, sharpening stones, abrasive paper and cloth, and pressure sensitive tape are now available.

Mr. Stanton is president of the new sales company with Edgar A. Maschal, formerly of Durex Abrasives Corporation, vice president and general manager. Directors include: A. Donald Kelso, executive vice president, Norton Behr-Manning Overseas Inc.; Jess N. Dalton and Julio Riquelme, both of Mexico City; Mr. Maschal and Mr. Stanton.

A $2½ million continuous galvanizing plant will be under construction shortly at Martins Ferry, Ohio, it was announced by J. H. McElhinney, vice pesident in charge of operations of **WHEELING STEEL CORPORATION.**

Planned and developed by Wheeling Steel engineers, the plant will follow basic principles perfected in a pilot plant that has been operated as an experiment for many months and will produce large tonnages of galvanized sheets in coils 3,000 to 4,000 feet in length. This zinc-coated steel is required by fabricators and sheet metal contractors, many of the former using the product in coils, while the latter generally specify merchant sizes of such steel in flat sheets sheared from the coils at the mill.

FINE ORGANICS, INC., according to Nicholas M. Molnar, president, has approved plans to enlarge buildings to house increased laboratory and production facilities at the Lodi, New Jersey plant. Research contracts from military services together with rapidly expanding requirements of the company's Aviation-Industrial Chemicals Division have made additional facilities urgently necessary.

The **DOW CHEMICAL COMPANY** has acquired a 600-acre tract of land near Williamsburg, Virginia, as a possible future plant site.

Options on the property, which fronts on the James River seven miles southeast of Williamsburg, were taken up by the Austin Company of Cleveland which does most of Dow's construction work and negotiated the purchase for Dow.

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Black Oxide finishing for rust resistance and decorative parts. Speedy black coating in water solution with no electric current. Permanent black finish on ordnance parts, tools, aircraft, bearing races. Dazzling black decorative finish for television cameras, business machines, hardware, metal screens and machine parts. Excellent bond for paints and enamels. Simple one bath operation. Write for bulletin H-16. Park Chemical Co., 8078 Military Ave., Detroit 4, Mich.

NEW POSITIONS

H. J. McCracken, president of the Northwest Chemical Co., Detroit 4, Mich., has announced the appointment of **HARRY AMEDRO** as Syracuse and western

Harry Amedro (left), Howard F. Johnson

Eliminate "Heavy Overtime"

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Good men are hard to get today. Why waste their time and your money—on the "jack-ass labor" job of scraping down spray-booths? Keep your booths clean, firesafe, better illuminated, better ventilated by using "LIQUID ENVELOPE".

Simply spray on with your regular spray-equipment. When overspray accumulates, break film and peel off in great big sheets. Takes only a few minutes for a 12 x 12 booth. Actually costs less than the hand-labor way. Order a 5-gallon Test Sample (Drum Lot Price on test-sample order!)

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M. E. Smith Co., Los Angeles, Calif.
C & H Supply Co., Seattle, Wash.
Hugh Russel & Sons Ltd., Montreal & Toronto, Canada

New York representative and the **JOHNSON SALES CO.**, Montclair, N. J., as its Middle Atlantic States representative.

Mr. Amedro attended Syracuse University where he majored in chemistry while employed in the Works Laboratory of the Allied Chemical and Dye Corp.

With a background of a chemical degree from Johns Hopkins University and special courses in physical chemistry and electroplating at New York University, Howard F. Johnson, head of the Johnson Sales Company, has had a liberal experience in chemical engineering.

Renshaw Smith, Jr., vice president in charge of trade sales for the Vita-Var Corporation, Newark, New Jersey paint manufacturer, has announced the appointment of **NED PEARSON** as Southern district sales manager.

Mr. Pearson will supervise and develop trade sales in Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, and Tennessee.

ROBERT S. MERCER has joined Pennsylvania Salt Manufacturing Company as sales engineer on corrosion resistant products, it was announced by Robert R. Pierce, sales manager of the Corrosion Engineering Products Department.

Mr. Mercer attended Drexel Institute, where he earned his Bachelor of Science degree in chemical engineering in 1935. He is a member of the American Chemical Society.

J. FRED DUDLEY has been appointed chief engineer of Commercial Solvents Corporation, it has been announced by Maynard C. Wheeler, vice president in charge of production and engineering. Mr. Dudley, who will make his headquarters in Terre Haute, Indiana, replaces **HOMER KIEWEG** who has been made manager of the Central Division of the production department.

J. Fred Dudley

Mr. Dudley joined Commercial Solvents in 1943, and was appointed assistant chief engineer in February 1951. He is a member of the American Chemical Society and the American Institute of Chemical Engineers.

LLOYD E. KELLY, manager of Eastern sales for the Pigments Department of the Du Pont Company, retired February 1 after 30 years with the company. He was succeeded by **WALTER J. BEASTEN**, a pigments salesman in the Philadelphia sales office.

Mr. Kelly joined Du Pont in 1921 as a chemist in the Chemical Department. Following his transfer to sales work, he held several positions until he was named manager of Eastern sales in 1945.

Mr. Beasten has been with the Du Pont Company since 1924. His first job was as an office boy in Wilmington, and he advanced through positions of clerk and sales clerk in other locations. In 1935 he was advanced to salesman and was transferred to the Philadelphia office.

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SAVE ON WHEELS . . . STEP UP PRODUCTION

Speeds from 1,500 to 3,000 RPM are instantly available with the turn of the dial while the lathe is in operation. Polishing and buffing (cut-color-satin) can be done on one machine with no delays or lost motion.

The Hammond VRO Variable Speed Polishing Lathe definitely will step up production and improve finish. Maximum wheel economy is assured, too, because efficient peripheral speed can be maintained at all times — wheels can be used right down to the flanges before discarding.

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DR. WILLIAM BLUM, internationally known for his contributions to the field of electrochemistry, has retired as Chief of the Electrodeposition Section of the National Bureau of Standards after 42 years' service. Appointed to take his place is **DR. ABNER BRENNER,** who has been engaged in electrodeposition research at the Bureau since 1930.

A graduate of the University of Pennsylvania with a Ph.D. degree in chemistry, Dr. Blum's many technical papers reflect his contributions to the field of electrodeposition. He is the author of

Dr. William Blum (left), Dr. Abner Brenner

chapters in several corrosion handbooks and of the revised third edition of the text, "Principles of Electroplating and Electroforming," as well as other technical articles.

Dr. Blum was recently honored by the Electrodepositers' Technical Society of London, being elected as an honorary member, the sixth in its 26 years of existence. He is also an honorary member of the American Electroplaters' Society. He received the Medal of the Institute of Chemistry for Distinguished Governmental Service in 1926 and the Acheson Medal of the Electrochemical Society in 1944. He has held a graduate research fellowship at the University of Pennsylvania.

He is a member of the American Chemical Society, the Electrochemical Society, the A.S.T.M., the Washington Academy of Science, and the American Association for the Advancement of Science.

Dr. Brenner received a B.A. degree in chemistry from the University of Missouri in 1929, a M.S. in chemistry from the University of Wisconsin in 1930, and a Ph.D. in chemistry from the University of Maryland in 1939. He received a research fellowship from the University of Wisconsin in 1930 and the Procter Award for the best papers presented to the 1946 and 1948 Annual Conventions of the American Electroplaters' Society.

Dr. Brenner is the author of many technical papers in the electroplating field. He is the inventor of the magnegage and has developed a process for the purification of rhodium plating solutions.

Dr. Brenner is a member of the American Chemical Society, the American Electroplaters Society, Electrodepositers Technical Society, the Electrochemical Society, the Washington Association of Scientists, Phi Beta Kappa, and Sigma Xi.

BURTON E. DRURY, JR., has been named sales manager of United Platers, Inc., Glenn H. Friedt, president, has announced. Mr. Drury, Jr., formerly was with Wilson Foundry & Machine Company for nine years, the last five as sales manager.

United Platers provides plating, rustproofing, and metal processing service to the automotive and allied industries. At the present time, the company is shifting most of its production to various defense projects.

In a continuing program of personnel expansion, Conforming Matrix Corp., Toledo, Ohio, has announced the appointment of **ELMER L. FABER** as plant superintendent and head of the engineering department and **MILTON T. SCHIMMEL** as engineering sales manager.

A mechanical engineering graduate of both Ohio Northern University and Co-

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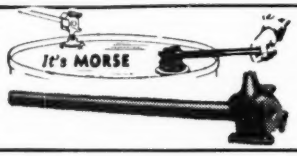

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lumbia University, Mr. Faber has served with the American Propeller Corporation, Willys-Overland Motor, Inc., Rabsom & Randolph Company, and as chief of

Elmer L. Faber (left), Milton T. Schimmel

methods at the Rossford Army Ordnance Depot, largest automotive and special equipment repair parts depot in the world.

Widely known for his experience in production spray painting and the designing and building of ovens and conveyorized equipment for spray finishing, Mr. Schimmel received his mechanical and electrical engineering education at the University of Cincinnati and the University of Toledo. He was formerly associated with the Bowling Green Rubber Company and the Manufacturers Enameling Corporation.

JESSE W. ROSENQUIST has been appointed territorial representative in Maine, New Hampshire, Vermont, and part of Massachusetts by the Mine Safety Appliances Company, Pittsburgh manufacturer of safety equipment for industry.

Mr. Rosenquist joined the company's sales engineering staff following his graduation from Loyola University, Los Angeles. His work up to the present has been concentrated on industrial safety problems.

JOHN R. HOOVER has been elected president of B. F. Goodrich Chemical Co., Cleveland, Ohio, it was announced by John L. Collyer, president, The B. F. Goodrich Company. He succeeds William S. Richardson, whose increased responsibilities as vice president of the parent company will include the chemical firm. He will continue to make his headquarters in Cleveland, where the chemical concern has its main offices.

Mr. Hoover was graduated from Harvard University in 1925 with a degree in chemistry; has been president of Plastic Materials Manufacturers Association, Inc.; and is a member of the Society of the Plastics Industry, Society of Plastics Engineers, American Institute of Chemical Engineers, and the Chemists' Club of New York.

ALAN H. HARRIS has been appointed products manager of the Phosphate Coating Division for Detrex Corp., Detroit 32, Mich., according to an announcement by W. F. Newbery, director of sales.

An alumnus of the University of Michigan, Mr. Harris holds degrees in both chemical and metallurgical engineering. During the past four years, he has held the positions of sales representative, and development technical coordinator.

According to an announcment by G. Klinkenstein, president of the Maas & Waldstein Co., Newark, N. J., **RICHARD S. BLAKE** and **SAUL ROBINSON**

Richard S. Blake (left), Saul Robinson

have been appointed to the M & W sales force. Mr. Blake will cover part of the Connecticut and western Massachusetts territory and Mr. Robinson has been assigned to the northern New Jersey area.

Both men have had experience as lacquer chemists, as well as devoting a good deal of their time to technical service problems in industry.

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ORVILLE O. KENWORTHY has been named assistant director of research in the Central Research Division of Ferro Corp., Cleveland, Ohio. Dr. G. H. McIntyre, vice president and director of research, said in announcing the appointment that rapid growth of the firm's research division has made closer supervision of projects necessary.

Orville O. Kenworthy

As assistant director, Mr. Kenworthy will assist Dr. McIntyre in directing Ferro's overall research program. He will also continue as director of chemical research, a position he has held since 1950.

Mr. Kenworthy, who joined Ferro in 1946, holds B.S. and M.S. degrees in chemistry from Oklahoma A & M College. He is a member of the American Chemical Society, Alpha Sigma, Phi Lambda Upsilon, and the Reserve Officers Association. He is a director of the Cleveland chapter of the Armed Forces Chemical Association and is listed in "American Men of Science."

Frank W. Beavers

The opening of a sales office in Cincinnati for Hercules Powder Company's Synthetics Department has been announced.

FRANK W. BEAVERS, formerly of the department's Cleveland office, will be technical representative in the Cincinnati office. According to the announcement, Synthetics also will have warehouse facilities in Cincinnati in addition to their present warehouse facilities in Louisville, Kentucky.

Mr. Beavers for the past five years has been a technical service representative for Synthetics in Ohio, Pennsylvania, Michigan, New York, and Canada. Previous to this he worked in Synthetics research and development group at Hercules Experiment Station in Wilmington. In this work the emphasis was on research related to customers' products.

The Electric Products Co., Cleveland, Ohio, manufacturer of special motors and generators, has announced that **DR. WILLIAM A. THOMAS** has joined its engineering staff.

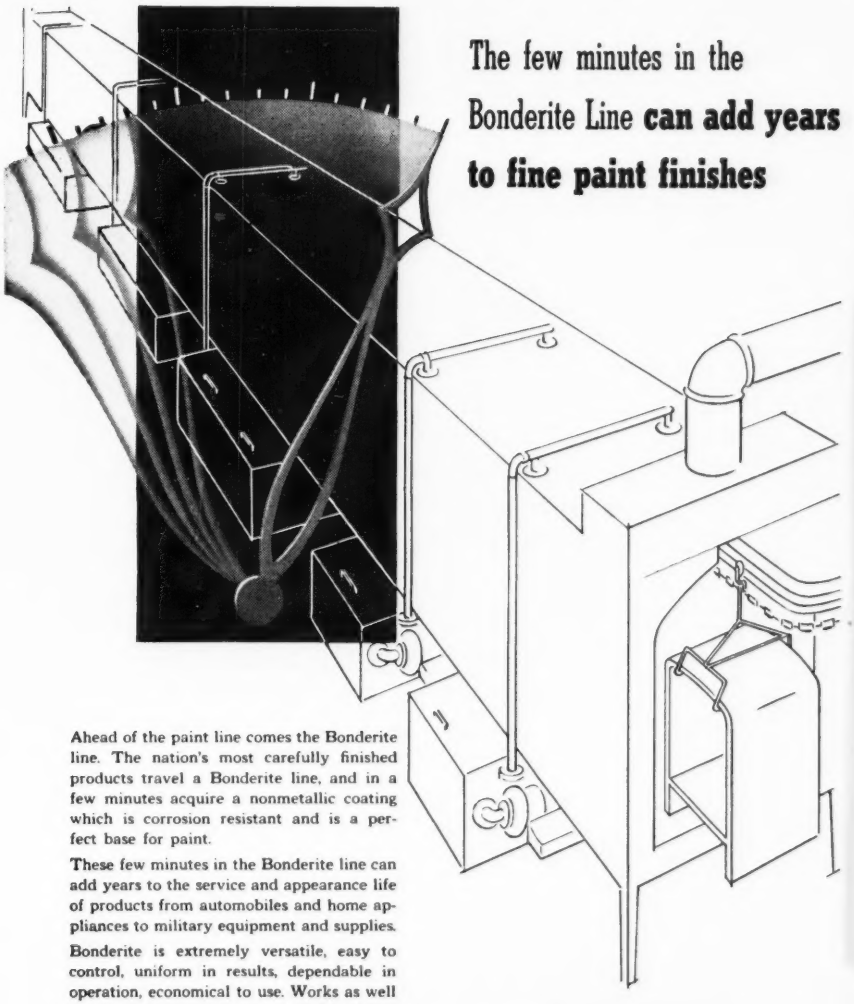
Dr. Wm. A. Thomas

Graduating from Case Institute of Technology, Dr. Thomas joined the engineering department of General Electric. Leaving there in 1930 he spent the following ten years teaching and gaining his master's and doctor's degrees in engineering. From 1940 to 1948 he was an electrical engineer with Du Pont and then returned to Case as professor of electrical engineering.

Active for many years in AIEE affairs, Dr. Thomas has been director of the Iowa Section and vice chairman and treasurer of the Wilmington Sub-Section. At present, he is chairman of the Basic Sciences Group of the Cleveland Section and is a member of the National Committee on Basic Sciences.

The Permutit Company has announced the appointment of **CLYDE R. POORE** as assistant sales engineer for its sales office located at 831 E. Morehead St., Charlotte 3, N. C. In his new capacity he will work with Norman D. Doane, sales engineer, in the sales and service of Permutit's line of industrial water conditioning equipment.

A graduate of Guilford College, North Carolina, Mr. Poore has had three years' experience in the application of industrial water conditioning apparatus.



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L. J. CARSON, former general manager of Link-Belt Company's Minneapolis plant, has resigned from his position as Price Executive of Machinery Branch of the Industrial Materials and Manufactured Goods Division of O.P.S. in Washington, D. C., and has been named general manager of Link-Belt's new Colmar, Pennsylvania plant. This plant is now under construction and is scheduled to be in operation soon.

GROVER C. HANSEN, manager of sulfuric acid production in the Grasselli Chemicals Department of the Du Pont Company, retired January 1 after more than 40 years with the department and its predecessor, The Grasselli Chemical Company.

Upon his retirement, sulfuric acid production supervision was assigned to **ALVIN A. COREY,** Graselli production manager.

Three appointments affecting Norton Company's Research and Development and Personnel departments were announced recently by Milton F. Beecher, director of research and development, and Frank Zacher, director of personnel.

DR. NEWMAN W. THIBAULT was named chief of a newly-formed Physical Research Section of the Research and Development department.

RICHARD E. ENGLUND became grinding service engineer in charge of a new Grinding Service Section.

Dr. Thibault will direct all physical research, and Mr. Englund all grinding tests and other services previously under the head of H. Walter Wagner who retired December 31.

In another move, **ROBERT W. CORNISH** was appointed supervisor of Training in the Personnel department. In this new capacity, Mr. Cornish will be responsible for both factory and sales training.

HONORS

In recognition of 60 years with the Norton Company, **GEORGE N. JEPPSON,** chairman of the board, received a gold medal struck especially for the anniversary. The medal was presented to Mr. Jeppson by company president, Milton P. Higgins, at the directors' dinner following the annual stockholders meeting in Worcester January 15. Indentical bronze medals were given all employees as a memento of the occasion.

Robert A. Weaver, chairman of the board of Ferro Corp., Cleveland, Ohio, presented three employees Weaver Awards for their outstanding contributions to the company in 1951. Winners are **JESSE D. WALTON, JR.,** research engineer; **RUDOLPH FOSTER,** production foreman in the smelting department; and **MICHAEL UNGAR, JR.,** production foreman in the milling department.

Mr. Walton, who was commended for initiative and skill in designing and constructing new research equipment, is a 1950 graduate of Georgia Tech. As a student, he was winner of Ferro's national Student Contest for the best paper on porcelain enameling.

Robert A. Weaver is shown presenting awards to (left to right) Jesse D. Walton, Jr., Rudolph Foster, and Michael Ungar, Jr.

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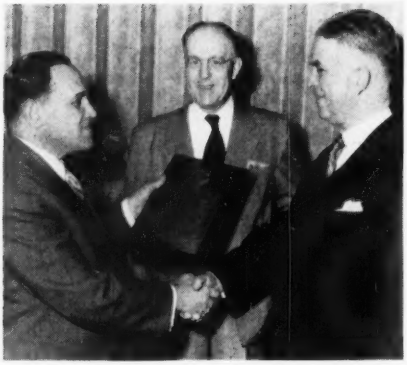

J. W. Haines is shown receiving the D. C. Ball Award for Distinguished Service from John A. Carter, Oakite president, as sales manager Frank L. Oldroyd looks on.

Messrs. Foster and Ungar were given awards for initiative and development of practical ideas that improved equipment and production in their departments.

J. W. HAINES, technical service representative of Oakite Products, Inc., manufacturer of industrial cleaning and allied materials, was the recipient of the D. C. Ball Award for Distinguished Service at the December technical-sales conference of Oakite field representatives held at the Hotel Statler in New York.

Presentation of the award, which is given in memory of David Clifton Ball, pioneer in industrial cleaning procedures, founder of the company, and chairman of its board of directors until his death last year, will be presented annually to the member of the firm's nationwide field organization adjudged to have rendered the most outstanding service to industry during the year.

In observance of their 25th anniversary in the employ of The Buckeye Products Company, Cincinnati, manufacturer of buffing and polishing compositions, President Arthur Hoffheimer recently presented wrist watches to **GOBLE RUSSELL** and **CARL TESCHNER.** Mr. Russell is now shop superintendent, having started in 1926 as a laborer, while Mr. Teschner is a machinist.

President Arthur Hoffheimer presenting wrist watches to Carl Teschner (left) and Goble Russell (right).

SOCIETIES

The **16th ANNUAL TECHNICAL SESSION** of the **BOSTON A.E.S. BRANCH** will be held Saturday, April 19, at the Hotel Statler in Boston.

Speakers for the program, which begins at 2 p.m., are Arthur W. Logozzo, Nutmeg Chrome Corp., West Hartford, Conn., "Modern Industrial Hard Chrome Plating"; C. F. Nixon, General Motors Corp., Detroit, Mich., president of the A.E.S., "Present-Day Decorative Plating"; and Dr. Louis Weisberg, consulting engineer, New York City, "Recent Developments in the Disposal of Plating Wastes."

On December 20 at a special meeting of **NIHON MEKKI KYOKAI, JAPANESE ELECTROPLATING SOCIETY** (J. E. P. S.), held in the Hall of Electroplating in Tokyo (Society headquarters and editorial office of "Mekki"—"Plating"),

The illustration at right is a report of the visit of Lt. Col. Blount to some of the plating shops in the Tokyo area, published in the Magazine "Mekki" (Plating). The article reports the inspection, by Dr. Tajima and Lt. Col. Blount, of the Miyata Works, Ltd., Ohsawa Plating Works, and Seikosha Works. The editor concludes the article by expressing his hope that the publication "Mekki" (being distributed also in the U. S.) may be helpful in strengthening ties of friendship between the U. S. and Japan.

ブラウント氏の
鍍金工場視察

友、遠方より来る有り、亦楽しからずや。

それは、田島博士の許にレスリーから着いた手紙で、今度日本へ行くことになったから、メッキ工場を見せてほしいとあった。——その手紙の主はブロックヴィル・ブラウント氏である。

Ezra A. Blount, editor of PRODUCTS FINISHING, presented a brief outline of "U. S. Electroplating Practice". The subjects covered in the talk were: basic differences in the U. S. and Japanese plating industry, bright nickel plating, diaphragm plating tanks, mechanical polishing and barrel finishing, anodizing, hard chromium and nickel plating, and bright dips for zinc.

The talk, as well as questions and answers, was translated into Japanese by Mr. Y. Takamizawa, of the Japan Iron and Steel Co., Ltd., formerly engineer to the Japan Nickel Information Bureau of the International Nickel Company. Blackboard sketches helped bridge the "language barrier", particularly in the description of that part of the paper describing elements of a diaphragm plating

Shown at the speakers' table, prior to the December 20 meeting of the Japanese Electroplating Society in Tokyo, are (left to right): Dr. Sakae Tajima, Lt. Col. Blount, and Mr. Y. Takamizawa, interpreter.

(Illustration and photo courtesy "Mekki," Tokyo, Japan)

tank installation. The members and guests present (limited to 50 by the size of the meeting room) showed great interest in this new development, as well as in brighteners and wetting agents for plating solutions.

The paper presentation and question period lasted three hours (including translation time)—quite a long meeting by American Electroplaters' Society standards. A wire recording of the meeting will be transcribed in both the Osaka and Nagoya Branches of the Japanese Electroplating Society.

The speaker was introduced by Dr. Sakae Tajima, professor of electrochemistry at Tokoyo Metropolitan University, counselor of the Japanese Electroplating Society, secretary of the Electrochemical Society of Japan, member of the Board of Trustees of the Society of Metal Finishing. At the conclusion of the meeting, Lt. Col Blount (the first representative of the U. S. electroplating industry to visit Japan since the war) was presented with a souvenir expressing the appreciation of the group by Mr. Jiro Takahama, "elder statesman" of the Society, director of Nihon Mekki Kyokai, and chief editor of the periodical "Mekki" (Plating) who closed the meeting with the traditional words of hearty thanks, "Domo arigato gozaimashita".

NECROLOGY

JAMES A. RAFFERTY, vice president and director of Union Carbide and Carbon Corporation, died December 19 at the age of 65.

Mr. Rafferty was a pioneer in the development of the synthetic organic chemical industry in the United States, which was built up largely under his direction since its beginning in 1920. During World War II he was executive official in charge of the extensive operations of Union Carbide in behalf of the Government.

JOHN F. SEGELCKE, sales manager of the Organic Acids and Plasticizers Department of American Cyanamid Company's Industrial Chemicals Division, died suddenly on Saturday, December 1.

Mr. Segelcke joined Cyanamid in 1921. He attended Columbia and New York Universities and was a member of the Industry Advisory Committee of the National Production Authority.

meetings

OF INTEREST TO FINISHERS

Feb. 16. Annual Educational Session and Banquet, New York Branch, A.E.S., Statler Hotel, New York, New York.

Mar. 3-7 Spring Meeting, American Society of Testing Materials, Hotel Statler, Cleveland, Ohio.

Mar. 10-14. Annual National Conference and Exhibition, National Association of Corrosion Engineers, Galveston, Texas.

Mar. 15. Annual Educational Session and Banquet, Dayton Branch, A.E.S., Biltmore Hotel, Dayton, Ohio.

Apr. 3-5. Pacific Coast Production Clubs' Symposium and Paint Industries' Raw Material and Equipment Exhibit, Biltmore Hotel, Los Angeles, California.

Apr. 19. 16th Annual Technical Session and Banquet, Boston Branch, A.E.S., Hotel Statler, Boston, Massachusetts.

Apr. 26. A.E.S. Indianapolis Branch Educational Session and Dinner-Dance, Athletic Club, Indianapolis.

Apr. 26. 10th Annual Educational Session and Banquet, Rockford Branch, A.E.S., Rockford, Illinois.

Apr. 28-30 Spring Meeting, American Oil Chemists Society, Shamrock Hotel, Houston, Texas.

Apr. 27-May 1. 54th Annual Meeting, The American Ceramic Society, William Penn Hotel, Pittsburgh, Pennsylvania.

May 4-8. 50th Anniversary Meeting, The Electrochemical Society, Benjamin Franklin Hotel, Philadelphia, Pennsylvania.

June 16-20. 3rd Industrial Finishing Exposition and 39th Annual Convention, American Electroplaters' Society, International Amphitheatre, Chicago, Illinois.

June 23-27. 50th Anniversary, American Society for Testing Materials, Hotels Statler and New Yorker, New York, New York.

Oct. 22-24. 21st Annual Meeting, Porcelain Enamel Institute, Greenbrier Hotel, White Sulphur Springs, West Virginia.

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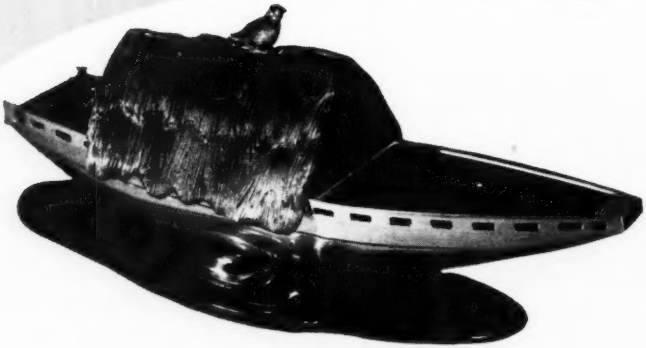
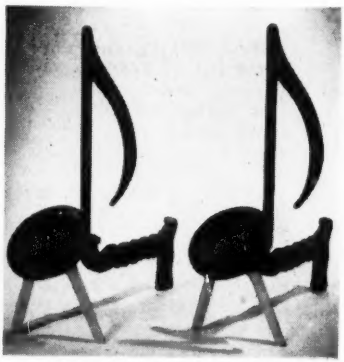


Product of Yamato-Gumi, Tokyo, Japan, this attractive candy dish, modeled after a Japanese house boat, is assembled from five lead-antimony castings. The base is finished in green lacquer to simulate the appearance of water. The boat hull is heavily copper plated and silver plated, then coated with clear lacquer. The fore and aft deck plates are copper plated, silver plated, black oxidized and coated with clear lacquer. The shelter is copper and silver plated, oxidized, then "highlighted" effectively before being clear lacquered. (The dish was presented to Ezra A. Blount, editor, upon the occasion of his recent visit to the Yamato-Gumi plant.)

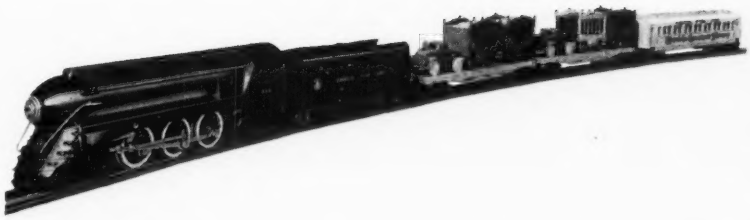
(PRODUCTS FINISHING Staff Photo)

These eye-catching, one-eighth musical note andirons are made of cast iron, sandblasted, and coated with Du Pont flat black paint. After drying, they are brushed to a dull gloss. The legs are coated with a gold bronze.

(Photo courtesy Tennessee Chromium Plating Co., Nashville 5, Tenn.)



that aid in appearance and utility

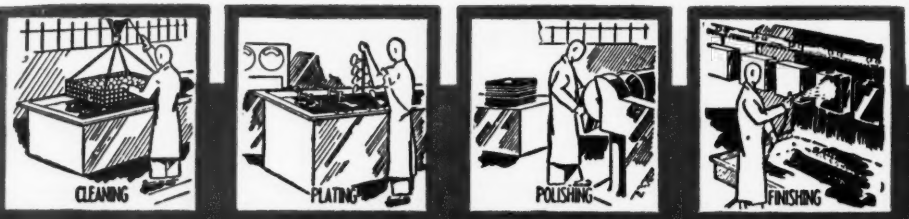


The circus train of the American Flyer Lines is finished attractively with lacquer. All parts are hand sprayed, the locomotve and tender in red, the flat car chassis and passenger car in yellow.

(Photo courtesy A. C. Gilbert Co., New Haven 6, Conn.)

The 21-inch apartment size model electric range has a one-piece, turret-type cooking top. The waist-high broiler has a lining finished in blue-speckled porcelain enamel and the front, sides, and top are finished with acid-resisting porcelain enamel.

(Photo courtesy Perfection Stove Co., Cleveland 4, Ohio



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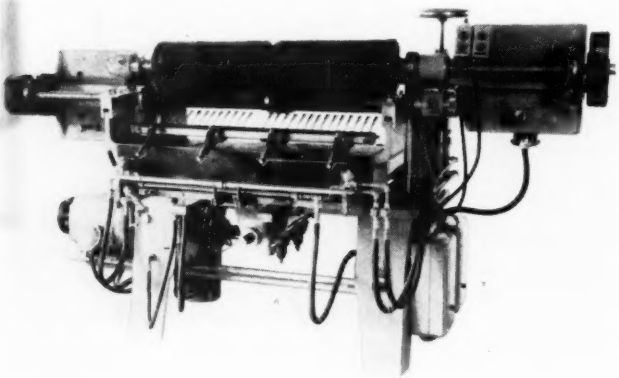
Surface Finishing Machine

The Clair Model 208 Surface Finishing Machine has been designed to eliminate serious time-consuming operations in the surface finishing of spoon handles, fork handles, and similarly shaped products. Although developed for a specific use through cooperation between Clair and several large silverware manufacturers, the machine is not limited to silverware applications but is recommended for many other curved items.

The Clair Model 208 Machine, product of the Clair Manufacturing Co., 1010 S. Union St., Olean, N. Y., allows batches of work to be transferred as units from one holding rack to another between bowl and handle operations. According to the manufacturer, the unit considerably speeds up production and also reduces the number of rejects.

When originally constructed, the Clair Model 208 Machine had the small spindle for finishing the backs of the handles at top, while the large spindle for finishing handle fronts was on the bottom. This arrangement permitted acceptable surface finish, but required extra effort on the part of the operator. On transferring the loads from the bowl-finishing machine, the operator had to turn the racks upside down before they were placed in the handle machine. Since 60 to 120 racks per hour were involved, Clair redesigned the machine, inverting the surface finishing rolls so that the racks did not have to be turned over.

Operated by either 7½ or 10 h.p. motors, the Clair Model 208 Machine has an automatic hydraulic "in" and "out" stroke which is adjustable from [illegible] to 24 inches. It is equipped with an air circuit which



Clair Model 208 Surface Finishing Machine

provides automatic float of buffs at any predetermined uniform pressure. The standard machine is built with a safety bar across the front which controls instantaneous opening of the rolls during loading or as an emergency measure. Among a wide variety of optional features are controls which open rolls and arrest all actuation at the completion of any predetermined number of strokes from 1 to 400.

Tantalum Heat Exchangers and Heating Coils

Plating solution heating and cooling coils made of pure tantalum metal have been made available to the electroplating industry by United Chromium, Inc., 100 E. 42nd St., New York 17, N. Y. Long a scientific curiosity, tantalum metal was finally produced commercially by Fansteel Metallurgical Corporation in 1922, and has found increasing applications in the chemical and electrochemical industries since that date.

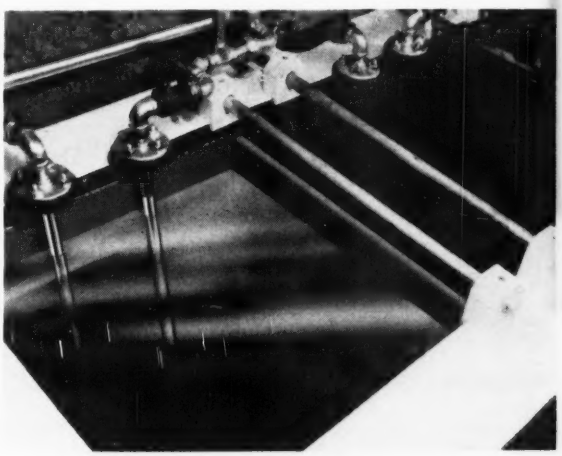
Of particular interest to platers is the exceptional resistance of tantalum to the acids commonly used in the plating industry. It is not merely resistant to these acids, but when used as recommended, it is actually acid-proof. Even "aqua regia," the mixture of acids which dissolves gold and platinum, has no effect on tantalum. Tantalum is recommended for use in chromium plating solutions, nickel plating solutions, and solutions of acids, such as hydrochloric, sulfuric, and nitric. It is not recommended for use in alkaline solutions.

Since tantalum is about as strong as steel, tubing need not be thick-walled to withstand high steam pressures. Also, since tantalum does not corrode under recommended conditions, extra wall-thickness in tubing is not required to allow for corrosion. The walls of tantalum tubing used in heating and cooling coils can therefore be made much thinner than those of lead tubing, resulting in quicker heat transfer. In addition, the heat conductivity of tantalum is two to three times that of lead.

Another advantage is that the initial heat conductivity does not decrease because tantalum does not react with plating solutions to form a heat-insulating coating on the coils like the lead chromate coating formed by lead reacting with chromic acid. Since tantalum is about as hard as steel, steam and water flowing through tantalum tubing do not erode away the metal. Its high resistance to thermal shock permits sudden changes in temperature such as caused by steam replacing cold water in the coil.

In electroplating, stray currents often flow through the heating coils making parts of them anodic. A stainless steel coil would have many advantages over a lead coil in a chromium plating solution if it were not for the fact that stainless steel dissolves rapidly in chromic acid when it becomes anodic. Tantalum, instead of dissolving when anodic, has the property of building up a high-resistance oxide film which stops the stray current.

United Chromium engineers design Unichrome Tantalum Heating Coils to meet the requirements of each installation. Immersion heating coils are made from tantalum tubing ¾-inch or 1-inch inside diameter and 0.013-inch wall. The hairpin type consists of a single tube bent in the form of a hairpin and held upright with the two ends above the solution. The vertical sides are 8 or 12



Tantalum Heating Coil

inches apart and the overall length is 20, 26 or 38 inches. The U-bend type is bent in the form of a U with the sides upright and the bottom as wide as required. Several coils are usually connected in parallel.

In the Unichrome Heat Exchanger, the plating solution is pumped through one or more tantalum tubes 1 inch outside diameter and with 0.013-inch or 0.020-inch wall. Each tube is surrounded by an outside shell of steel through which steam or cold water is circulated. Unichrome Heat Exchangers are designed to meet the requirements of each installation. The common sizes contain 1, 2, 4, or 6 tantalum tubes of various lengths up to 8 feet depending upon the amount of heat transfer required. Chromium plating plants which have installed Unichrome Tantalum Heat Exchangers have reported that automatic temperature recorders show temperature graphs of exceptional uniformity.

Die-Cut Masking Tape

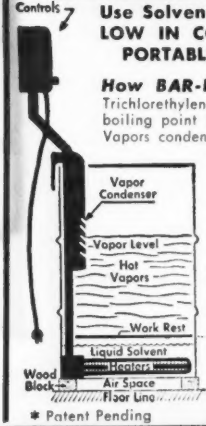
Panoco, 505 Carroll St., Brooklyn 15, N. Y., has available Die-Cut Masking Tape which proved such a great assistance in accuracy and speed in masking operations during the last war.

Die-Cut Masking Tape is now in use in many plants pressed for speed and accuracy in defense orders, where accurate masking operations are required, it is stated.

Panoco die-cuts Minnesota Mining and Manufacturing Company's Masking Tapes to the exact sizes, and is delivered as individual pieces to its customers. This method eliminates the time consumed in cutting tape in odd shapes for specific surfaces to be masked.

MOST REVOLUTIONARY DEGREASER DEVELOPED!

BAR-L* Vapor DEGREASER



Use Solvent Drum for a Tank! LOW IN COST—ECONOMICAL PORTABLE and PRACTICAL

How BAR-L Degreaser Works

Trichlorethylene solvent is heated to a boiling point in lower section of drum. Vapors condense on work and wash off oil, grease and dirt. Most parts can be cleaned in seconds! Solvent vapors are kept *inside the drum* by a scientifically-designed condenser which returns solvent to boiling chamber. REMEMBER: Anything that can fit into a solvent drum can be cleaned in a BAR-L Degreaser! And it's priced right!

Write for details on other "MP" Degreasers.

* Patent Pending

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METAL CLEANING CHEMICALS AND EQUIPMENT

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Corrosion-Resistant Coating For Detrex Degreasers

A tough material with superior corrosion-resistant properties has been developed and is now being used by Detrex Corp., Detroit 32, Mich., for coating the inside of its standard line of VS-800, hand-operated, solvent-vapor degreasers. This non-porous, phenolic-type coating, which is called Detrex FF-1, has proved to be exceptionally desirable from a standpoint of service life and maintenance. It is remarkably impervious to any dissolving effect by trichlorethylene and perchlorethylene. It is also strongly resistant to any chemical breakdown that might be caused by water-solvent mixtures, and relatively strong solutions of acids and alkalies and their vapors, it is claimed.

Machines coated with FF-1 have been production tested for several years under severe operating conditions without any sign of failure.

Drying Metals by Water Displacement

A water shedding compound known as Water Displacing Liquid No. 51 has been added to the line of water shedding agents produced by Enthone, Inc., Dept. PF, 442 Elm St., New Haven, Conn. The manufacturer claims that this product, which is a light liquid designed to displace water films from the surface of any metal, offers specific advantages over those previously announced.

The water is rapidly repelled from the metal surfaces by the liquid and settles separately to the bottom of the container.

Impressive

The ways and means of making things impressive varies with the subject. The photographer's art speaks for itself. However, with products, the most important way to make a lasting impression is through a finish that fully enhances every detail of the merchandise.

Allow our Creative Studio to develop a distinctive finish that will impress you, your customers, and worthwhile prospects. No obligation to reputable firms for this sample-finishing service.

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For more complete information on products and processes use READER SERVICE CARDS inside covers.

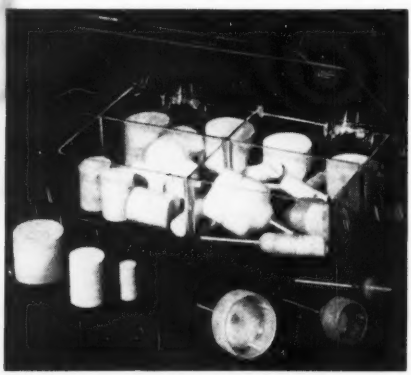
Light agitation will force water out of crevices and holes in parts. Tarnishing, staining, and deposition of solid residues are said to be prevented by a thin film remaining after evaporation of the solvent at room temperature. This thin film can be removed conveniently by vapor or liquid solvent degreasing if a perfectly clean surface is required.

It is claimed that Water Displacing Liquid No. 51 leaves a scarcely detectable liquid film which offers moderate protection against rusting or corrosion, and is said to be compatible with most rust-proofing and lubricating oils.

The manufacturer states that the combination of Water Displacing Liquid No. 51 and Enthone's Emulsion Cleaner 75 offers a convenient method of cold cleaning to remove oil, dust, chips, and other solid dirt. The work is immersed in Emulsion Cleaner 75, rinsed with cold water, and immersed in Water Displacing Liquid No. 51 to shed the water film and leave a thin protective coating after evaporation of the solvent.

Nylon Holder for Felt Polishing Wheels

A completely different type holder for felt polishing wheels has been added to its line of mold polishing supplies by the Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12, Mich. Molded of durable nylon around a ⅛-inch diameter steel mandrel insert, the holder eliminates all danger of damaging the work surface.



Plastic kit containing felts and nylon holders for felt polishing wheels

The socket-type design of the unit utilizes the centrifugal force of the felt in conjunction with the raised "beads" along the inside diameter and bottom of the holder to give a solid gripping action on the felt bob, thus completely preventing slippage and eccentricity. The design, according to the manufacturer, also gives longer life and greater versatility to the felt because it can be re-dressed right down through the axis without running into the center of the shaft.

Produced in ¼, ½, and ¾-inch diameters, the holders, together with an assortment of matching high-grade felts, are packaged as a kit in a transparent plastic container. The container itself, with the hinge top and neat compartments, not only furnishes permanent, clean storage facilities for the holders and felts but allows the polisher to separate the various felts which have been used with different grades of polishing compounds.

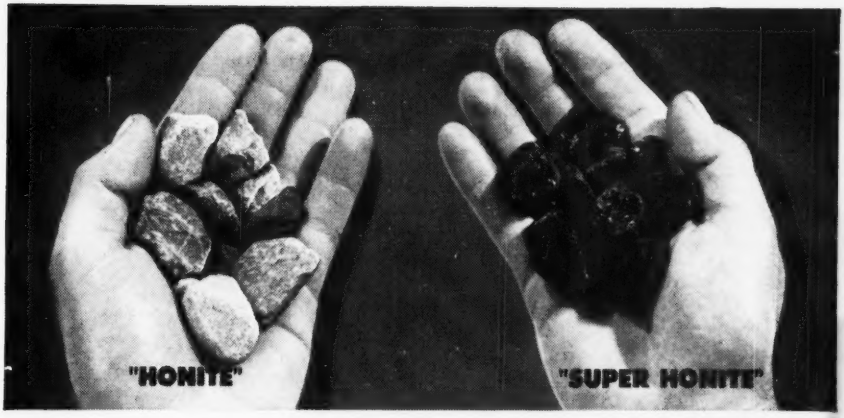
Ferrolum Lead Clad Steel and Cupralum Lead Clad Copper

Two acid-resisting lead-clad metals have been introduced by Knapp Mills, Inc., 23-15 Borden Ave., Long Island City, New York.

Ferrolum is made by inseparably bonding lead and steel in such a way that the finished product combines lead's unique immunity to sulfuric acid with steel's strength.

Cupralum is the result of inseparably bonding lead and copper, thereby retaining the best features of both metals: lead's acid resistance and copper's high electric conductivity and heat transfer.

Both metals offer a solution to corrosion problems known with the usage of



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Get smoother, faster barrel finishing with the toughest abrasive chips on the market—"Honite" and "Super Honite!"

"Honite" retains a cutting edge longer than any other *natural* barrel finishing abrasive. It's ideal for fine finishing to close tolerances, and for many other jobs involving a minimum amount of metal removal.

"Super Honite" is a heavy, *synthetic* stone that gives more than twice the life of other abrasives—the only stone engineered for both grinding and finishing.

And, like other stones, "Honite" and "Super Honite" work best in combination with "Honite" Compounds—the "secret of success" for dependable, consistent finishing results.

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sulfuric acid. It is stated that the metals will find wide usage in industry, being already applied by chemical equipment manufacturers, construction engineering firms, and many others.

Cupralum allows replacement of water by freon and direct expansion of freon, and is therefore expected to find wide usage where rapid heating and cooling of acids are required.

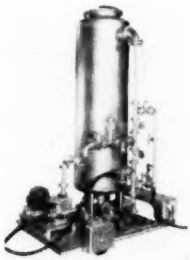
Wide usage is anticipated for Cupralum anodes in hard chromium plating since there anodes are stated to increase the current-carrying capacity to a large extent.

Knapp Mills does not intend to supply all the demands themselves but will license its process. Electro - Cupralum anodes and Cupralum coils can be obtained from The Udylite Corp., Detroit 11, Michigan.

Portable Chrome Purifier

Illinois Water Treatment Co., 840 Cedar St., Rockford, Ill., has announced a portable version of its Chrome Purifier for recovering and purifying chromic acid anodizing baths, and reclaiming plating and rinse waters.

The Chrome Purifier eliminates the necessity of discarding chromic acid which is normally replaced with fresh acid to maintain a required pH and acid concentration. Contamination of the acid solution is kept at a minimum when processed by this method, it is stated.



Illco-Way Chrome Purifier

In plating, the unit permits recovery of contaminated chrome plating baths. Clear solutions produced by this method reduce current requirements and provide uniform plating, resulting in fewer rejects, it is claimed.

The Illco-Way Chrome Purifier is available in four standard sizes, each size available in stationary models (for permanent installation) and portable models (for treatment of several solutions located throughout the plant).

Portable units are easily moved and stored and thus do not take up valuable plant production space.

Modern Masking Materials and Methods for Fabrication and Spray Finishing

By Arthur P. Schulze

64 Pages ***47 Illustrations***

Written for department superintendents, shop foremen, process and finishing engineers . . . this manual is a source of ideas for saving time, cutting costs and getting better product quality.

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Panel Vent Set

DeBothezat Fans Division of American Machine and Metals, Inc., East Moline, Ill., is offering its Panel Vent Set for use at free delivery or relatively low static pressure. Available with fan wheels 24, 30, and 36 inches in diameter, it has air-moving capacities up to 13,190 cubic feet per minute.

According to the manufacturer, all Panel Vent Sets have totally-enclosed ball bearing motors which are wound for dual voltage. Shutters and safety screen guards are available.

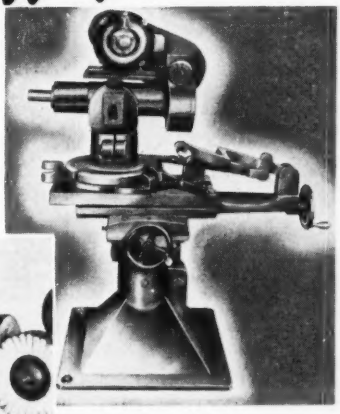
Immunol

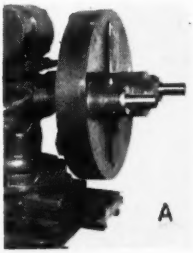
Immunol, a neutral, non-ionic liquid originally developed for use in long dilution with water as a rust preventive and detergent by the Haas Miller Corp., 4th and Bristol Sts., Philadelphia 40, Pa., has

ACME *Automatic Polishing and Buffing Machines*

The ACME Type B-10 Semi-Automatic

This machine gives very efficient production. One operator normally operates two or more units, one at each end of lathe, loading and unloading one while the other has work in contact with wheel.





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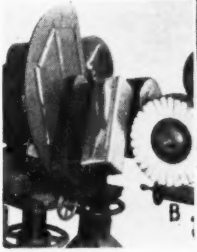

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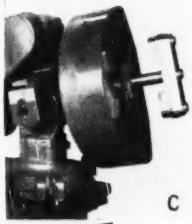

C

(A) Equipped with A-2 head handling parts up to 12" diameter.

(B) Equipped with Acme patented Geared Chuck; keeps rectangular or other out-of-round work in constant uniform wheel contact.

(C) Geared chuck for polishing or buffing faucet bodies. Production up to 240 pieces per hour.

This single spindle machine is used with the conventional lathe for finishing cylindrical parts. Toggle slide, vertical and cross slide adjustments permit quick set ups when changing jobs. Additional accessory equipment can be furnished for finishing a large variety of out of round parts as well as cylindrical work.

Catalogs on request

ROTARY STRAIGHT LINE SEMI-AUTOMATIC AND SPECIAL *Polishing and Buffing Machinery*

ACME *Manufacturing Co.*

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Builders of AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

been adapted to use in rinsing after plating to eliminate water stains. Added to the final rinse, it is claimed to prevent the rinse water from coalescing to cause stains on plated parts after removal from the rinse and at the same time protect bright finishes.

According to the manufacturer, Immunol requires no special handling or preparation, and is non-flammable and non-toxic. Bath temperatures may be hot or cold, depending on individual cycles.

Phospray

Du-Lite Chemical Corp., Middletown, Conn., has developed Phospray, a cold spray bonding solution which can be applied with ordinary spray equipment. The bond is said to eliminate preparatory steps, such as cleaning, rinsing, drying, and so on. It is simply sprayed on the product, where it dries immediately, ready for application of the final finish.

Usable on all metals except aluminum, Phospray can be cut as high as three parts thinner to one part Phospray without reducing its effectiveness, the company states. It has been thoroughly tested to Government specifications, withstanding conditions of humidity, salt spray, and so on, while furnishing the bond for a 150 mm. paint coating.

Improved Rust Inhibitor

An improved formula of its Certified Rust Inhibitor No. 425 has been announced by United Laboratories, Inc., Cleveland 12, Ohio. Outstanding features of this paint are that it will dry in 10 minutes under normal drying conditions, and one coat provides excellent hiding of the old metal surface, the manufacturer states.

The new formula, known as Rust Inhibitor No. FD-425, will withstand temperatures from minus 100 to plus 250 deg. F., and is exceptionally resistant to salt air and fumes, it is claimed. It may be applied over damp surfaces, interior or exterior, galvanized metal, and new or rusted metal surfaces of all kinds.

Sequestering Agent TTA

A sequestering agent, TTA (2-Thenoyltrifluoroacetone), is being manufactured and sold in limited quantities by The Dow Chemical Company, Western Division, at Pittsburg, California.

TTA is an organic compound which has the unique property of forming complex molecules with various metal ions in solution. It is stated that the use of the material permits the separation of ions which are ordinarily difficult to separate chemically since small adjustments in pH cause pronounced changes in the amount of complexing.

NEW BOOKS

Chemical and Physical Determinations for Porcelain Enamel Plants. By Michael Bozsin. Published by the Ferro Corp., Cleveland 5, Ohio. Price, $3.00.

Mr. Bozsin, an analytical chemist by training and experience, is extremely well quailfied to write on this subject. For the past 18 years he has been carrying out and supervising the gathering of this published data under actual operating conditions in porcelain enameling plants throughout the United States. Most of the details of the techniques described have been developed, tested, and perfected under his direct supervision.

The object of this 76-page publication is to describe, in detail, quantitaive analytical procedures for the determination of all deleterious gases (halides, sulfur compounds, moisture, carbon dioxide, carbon monoxide, and oxygen), pyrometric and draft measurements and their significance for the production of quality porcelain enameling and lowered rejects, with consequent savings in operating costs.

The book is well illustrated with diagrams, photographs, and graphs. All ne-

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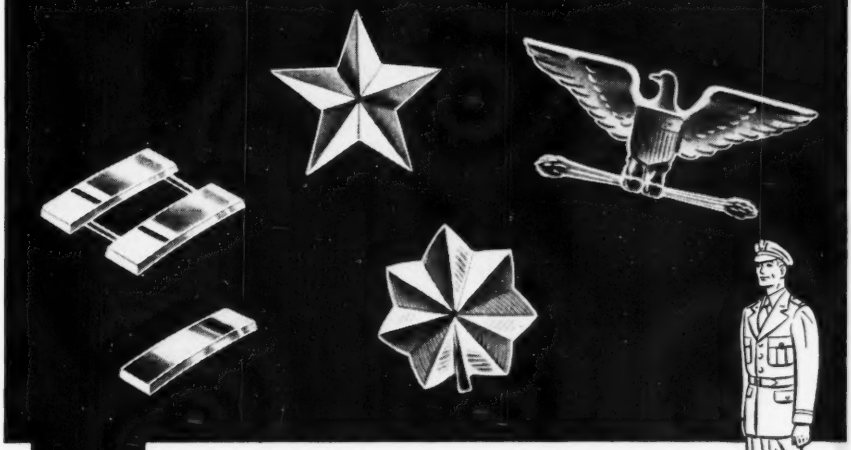

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cessary calculations are clearly presented with examples. Fifteen charts and tables on vapor pressure, humidity, and temperature, together with formulae are presented in the appendix for the reader's convenience in this handy reference book.

Paint Film Defects, Their Causes and Cure. By Manfred Hess. Published by the Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. 544 pages. Illustrated. Price, $12.00.

This book, stated to be one of the most complete compilations of paint defects and failures in existence, was written as a reference work, with the contents arranged accordingly. Provided with cross references, the contents are arranged in a manner whereby Failure — Cause — Remedy appear under such sections as: Faults which developed during application; Failures developing shortly after application; and Defects of coatings on the finished objects when in use. Over 80 photographs, many taken by the author, illustrate the many types of paint failures that can occur.

This first English edition is based on the standard German work but has been largely rewritten and enlarged. Many new sections connected with paint failures as they occur in typical damp climates and important developments in the raw material side of the paint and varnish industry have been added.

A Basic Training Manual on Statistical Quality Control. By Rudolph Freedman and Joseph Movshin, in cooperation with the Industrial Engineering Department of Washington University. Published by the St. Louis Society for Quality Control, 6651 Kingsbury St., St. Louis 5, Mo. 78 pages. Illustrated. Price, $2.50.

This manual has been written for use in short elementary courses in statistical quality control. It may be used for in-plant training, short courses, or a laboratory manual in conjunction with a standard text on quality control in a full course.

The manual consists of a brief text which is included to serve as a set of notes for the student. The heart of the manual is a series of work sheets covering frequency distribution, X and R charts, p charts, pn charts, c charts, and sampling techniques.

In quantities of ten, copies may be obtained at $2.00 per copy, and an instructor's guide is available on request at no extra charge with each order of ten or more copies.

Industrial Solvents. Second edition. By Ibert Mellan. Published by the Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. 758 pages. Illustrated. Price, $12.00.

Completely rewritten, this edition has included all recently introduced solvents and deleted all obsolete information. The early chapters in this book are devoted to theoretical aspects of solutions. Detailed consideration to over 380 solvents, grouped to meet the needs of all industries, is given in subsequent chapters. The text covers physical data and solvent application in such industries as paint, varnish, lacquer, and metal are thoroughly discussed. A large number of graphs and tables have been included to afford the reader an efficient means of obtaining specific and comparative information on the physical properties of solvents. Special attention is given to evaporation ratio, solubility, phase equilibrium and dilution ratio. A chapter on the handling of toxic and flammable solvents has been added.

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Paint and Varnish Production Manual. By Verne C. Bidlack and Edgar W. Fasig. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 288 pages. Price, $6.50.

This well illustrated book, designed for production personnel in the manufacture of surface coatings and for those interested in problems of management, has many valuable suggestions which are of interest to all who transform company policy into tangible results in this and allied industries. A discussion of plant facilities and engineering factors, such as

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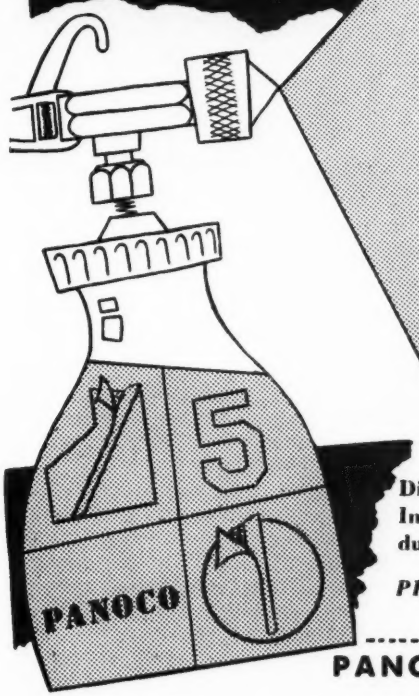

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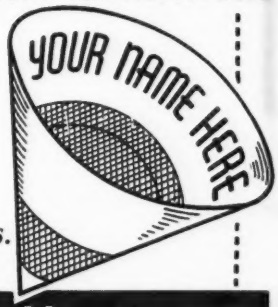

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general procedure, production planning and control, and maintenance, is presented in detail.

Cleaning and Preparation of Metals for Electroplating (A.E.S. Research Report Serial No. 18). By Henry B. Linford and Edward B. Saubestre. Published by the American Electroplaters' Society, P. O. Box 168, Jenkintown, Pa. 84 pages. Illustrated. Price, $1.65.

This book concerns itself with the cleanliness requirements of metals being prepared for electroplating. It is divided into three parts: critical review of literature; soiling and cleaning procedures; and degreasing evaluation tests: The Atomizer Test.

Modern Pyrometry. By Charles H. Campbell. Published by the Chemical Publishing Co., Inc., 212 Fifth Ave., New York, N. Y. 150 pages. 57 illustrations. Price, $4.00.

This book covers the types and uses of thermocouples and allied equipment; temperature indicators, recorders, and controllers; various methods of controlling and recording temperatures; and maintenance and care of pyrometers. Sufficient types and makes of pyrometric systems are discussed to give a fairly accurate picture of temperature measurement and control methods available.

New Products and Services. Published by The New York Journal of Commerce, 63 Park Row, New York 15, N. Y. 80 pages. Price, 50 cents.

This 80-page compendium of time and money-saving innovations bulges with prime examples of American inventiveness. All of the year's most successful creations are fully described and neatly cross-indexed in the illustrated booklet, in all, over 1,000 different products and ideas.

Analysis of Electroplating and Related Solutions. By K. E. Langford. Published by "Electroplating and Metal Finishing," 83-85 Udney Park Rd., Teddington, Middlesex, England. 369 pages. Price, $8.00.

This well-illustrated, indexed, and cross-referenced book lists over 300 methods for determining the principal constituents and impurities of metal treating baths. Special chapters are devoted to Sampling, Control of Cleaners, Pickles, Dips, Etches, Phosphating Solutions, and Electrobrighteners. Written for the plating chemist, engineer, foreman, or manager, it can be readily adopted as a text book.

Over twenty tables present chemical and physical data and conversion factors which are useful in solving everyday problems of the plater.

Precision Finishes Mechanically with Roto-Finish. All the facts that every user needs to know about the original Roto-Finish process are contained in the Roto-Finish catalog released by the Roto-Finish Co., 3700 Milham Rd., P. O. Box 988, Kalamazoo, Mich. The book shows in detail how the Roto-Finish process can be used for mechanical deburring, descaling, polishing, britehoning, and coloring of intricately shaped products.

The profusely illustrated, 16-page book is divided into five sections. The first section explains the advantages of the process; the second part concisely explains the process itself, what it is, how it works, and how it is used; the third deals primarily with the types of finishes that the process can produce; the fourth briefly and concisely tells how to obtain the best results through selection of the right Roto-Finish machine and the right Roto-Finish chips; and part five shows typical parts improved by the process. The balance of the book is devoted to illustrated descriptions of the Roto-Finish chips and finishing compounds. The back page of the book shows the Roto-Finish laboratory and offers the services of the company's engineers in solving finishing problems.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

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can automatically finish your job faster, better or cheaper regardless of size, shape or material.
Micro-Polish is an amazingly versatile and consistently successful automatic polishing method useful on any job from the pre-polishing of low grade steel sheet, to meet high quality job specifications, to the production sharpening and polishing of pruning tools.
Micro-Polish can precision finish any size, shape or length of sheet, strip or blanked stock in ferrous or non-ferrous metals, wood, fiber, plastic, rubber or leather, by wet or dry process.
A Micro-Polish giant used in reclamation grinding of steel strip.
One of our smaller units used in polishing narrow bi-metal stock.
A belt conveyor unit for polishing flat stampings and forgings.
A compact two head unit for polishing flat bar stock.
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POST OFFICE BOX 180 — BIRMINGHAM, MICHIGAN
AUTOMATIC POLISHING, BUFFING, GRINDING EQUIPMENT

PRODUCT LITERATURE

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.

"The Key to Your Finishing Problems" is the title of a six-page brochure describing the various features and applications of pressure-cooled Airflow buffs and Aircon wheels.

Available from the United Buff Products Corp., 242 Oak St., Passaic, N. J., the brochure depicts several of the buffs and wheels, and has a chart showing diameters of buffs vs. r.p.m. and surface speed (s.f.m.).

Brookfield Synchro-Lectric Viscometer. A six-page catalog describing this Viscometer and a Mixer is available from Henry A. Gardner Laboratory, Inc., 4723 Elm St., Bethesda 14, Maryland.

The viscometer measures the torque of a spindle rotation at constant speed through a calibrated spring. The dial is graduated in centipoises. A cutaway view of the instrument is given, together with such characteristics as accuracy, ranges, sensitivity, and adjustments.

Water Displacing Liquids. Data sheets are available from Enthone, Inc., Dept. PF, 442 Elm St., New Haven, Conn., which describe water displacing liquids, Nos. 1, 2, and 51.

Uses for these liquids and the technique in their application are given. Other technical data, such as flash point temperatures, are included in the discussion of these water shedding liquids.

"Chemicals by Octagon" is the title of a 28-page catalog available from Octagon Process Inc., 18 Bank St., Staten Island 1, N. Y. The catalog tables a lengthy list of chemicals available from the company. It also introduces Octagon's line of solvents and detergents, and discusses other available products such as phosphatizing compounds, demasking agents, bright dips, pickling acids, and temporary protective coatings.

Horizontal Plating Barrels. The 1951 issue of a 12-page catalog on horizontal plating barrels has been released by The Udylite Corp., 1653 E. Grand Blvd., Detroit 11, Mich. The catalog lists and depicts the various types of barrels and their major specifications. Special units, such as multiple unit plating barrels, monorail hoists, individual hoists, and various types of cylinders, such as Bakelite, hard rubber, Lucite, and melamine, are included.

Several pages are devoted to plating barrel accessories and equipment, and plating cycle shop layouts. In the latter dimension diagrams are given with step-by-step details of the operations.

"Aluminum Powders and Pastes" is the title of an 84-page manual published by the Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky. It covers not only the more familiar uses of powdered aluminum in aluminum paints, iridescent auto finishes, roof coatings and the like, but also describes many unique applications.

The manual discusses in detail characteristics of the various types of powders

what type of

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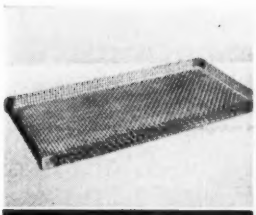

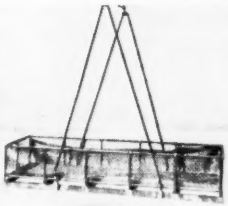

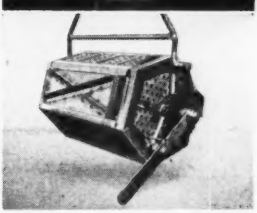

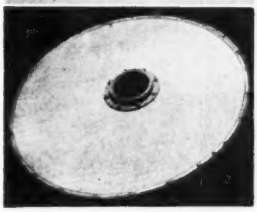

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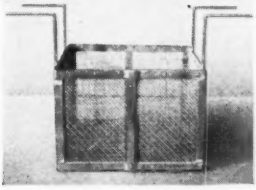

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and explains their relation to the purposes for which they are used. Other chapters discuss physical properties, chemical properties, testing and evaluation methods, recommended handling and storing procedures.

This 6 x 9-inch ring-bound book will be sent to engineers, technical men, and executives who request it on their business letterhead.

Practical Surface Tension Secrets for Platers. By Joseph B. Kushner, Director, Electroplating School, Dept. PF, 115 Broad St., Stroudsburg 1, Pa. The nine-page booklet, written in simple language and illustrated with explanatory sketches, is easy to read and provides down-to-earth information for the painting shop. Such topics as what is surface tension, its application in metal cleaning, its effects on pitting, rough plating, chrome spray, dragin and dragout, and others are taken up in detail.

The booklet may be obtained, free of charge to any member of the industry, by writing to the above address, stating name, company, company position, and company address.

Custom Grinding and Polishing. Facilities for custom grinding and polishing of stainless steel and other sheet metals are described in a folder available from the American Nickeloid Co., Peru, Ill. The literature describes in detail the firm's capacities for handling sheets up to 60 x 144 inches, producing a surface ground to any desired degree of roughness or high polish. Sheets of Monel, solid nickel, brass, copper, zinc and carbon steel, as well as stainless steel, can be ground on one or two sides in a wide range of gauges.

Prufcoat Heavy-Duty Primer P-50, a rust-inhibitive primer that is completely effective under practical plant conditions and can be used with either conventional paint or active-solvent top coats, is the subject of **Technical Bulletin Sheet No. 015** available from Prufcoat Laboratories, Inc., 50 E. 42nd St., New York 17, N. Y. Versatile, time and trouble-saving, the primer can be used on either ferrous or non-ferrous metals.

Automatic Plating Machines. A catalog is available from The Udylite Corp., 1653 E. Grand Blvd., Detroit 11, Mich., which depicts and discusses plating machinery.

Dwelling first on general design features built into all the company's machines, the catalog then describes in detail the single row full automatic return type, the double row full automatic overhead straight line, and the junior and rotary full automatic plating machine. Other special features such as agitation section and full automatic supplementary units are also discussed.

Flash-O-Lens. A leaflet has been issued by Henry A. Gardner Laboratory, Inc., 4723 Elm St., Bethesda 14, Md., on an illuminated magnifier for inspection. Various models and types are pictured and described, and their uses for many types of inspections pointed out.

Hercules CMC. The many important applications for Hercules CMC, and its physical and chemical properties, are fully described in a technical booklet published by Hercules Powder Company, Wilmington, Delaware.

Information on types available, viscosity, compatibility, and other pertinent data are contained in the booklet. A bibliography lists most of the published literature appearing in recent years on this chemical.

Industrial Instruments. Minneapolis Honeywell Regulator Co., Brown Instruments Div., Station 40, Philadelphia 44, Pa., has prepared **Catalog No. 5000,** consisting of 28 pages, which describes the

principal instruments, control devices, and related components manufactured by the company.

Specifications of approximately 100 measuring and control instruments and valves are outlined. There are several new designs, including the Differential Controller and Tel-O-Set Controller.

Sorbit Technical Bulletin. A technical bulletin on Sorbit, a sodium alkyl naphthalene sulfonate surface active agent, has been released by the Alrose Chemical Co., Providence 1, Rhode Island.

The bulletin lists both forms of the cleaner, Sorbit AC, a paste, and Sorbit P, which is in flake form. Included are specifications, solubilization, foam, and emulsification characteristics; its detergency and wetting properties; and its biological properties. Its various applications are listed together with technical data such as concentration percentages and operating temperatures.

Codman Buffs and Polishing Wheels. A large 24-page catalog (**No. 52**) is available from the F. L. & J. C. Codman Co., Rockland, Massachusetts.

The well-illustrated catalog discusses the various types of buffs available, their construction, nomenclature, and uses. Contact and polishing wheels are also pictured and described, as well as accessories.

Totrust Instant Dry Metal Coat is the subject of a technical sheet released by The Wilbur & Williams Co., 130 Lincoln St., Boston 35, Mass. Listed in the leaflet are the advantages of this one-coat exterior or interior metal application.

Washability and Abrasion Testing Machine. A four-page bulletin issued by the Henry A. Gardner Laboratory, Inc., 4723 Elm St., Bethesda 14, Md., depicts and discusses the Gardner Washability and Abrasion Testing Machine, an instru-

Remington Rand "Kompakt" and "Twinpakt" file fasteners by-pass costly, time-consuming metal finishing processes by using Enamelstrip in continuous feed coils. Enamelstrip is coated BEFORE fabricating by an exclusive technique which achieves a finish that withstands the stresses of drawing, bending and forming without cracking or peeling. Your company, too, can enjoy the advantages of Enamelstrip . . . any metal in any finish coated and slit to your specifications.

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ment for easy determination of abrasion and washing resistance of paints and other coatings.

The bulletin points out the important features of this machine and lists 14 tests to meet specifications for which it has been approved.

Hammond Catalog No. 75. Hammond Machinery Builders, Inc., 1622 Douglas Ave., Kalamazoo, Mich., has available **Catalog No. 75** which describes and depicts bench and floor-type wheel grinders, polishing lathes, and backstands of various sizes and capacities for abrasive belt applications.

The 20-page, colored catalog covers the complete line of abrasive belt and wheel, grinding, polishing and buffing machinery. Complete specifications are given for all machinery shown. Also featured are needed accessories for buffing and polishing operations. The final pages of the catalog give complete information on the Hammond Cyclone and Filter-Type Duskolectors.

Full Automatic Barrel Plater. The Stevens Super E machine is described and illustrated in a data sheet issued by Frederic B. Stevens, Inc., Detroit 16, Mich. Typical capacity in zinc plating is 1,800 to 2,000 pounds of bolts and nuts per hour.

Rubber Linings. Metalweld Inc., 26th and Hunting Park Ave., Philadelphia 29, Pa., has released a four-page catalog which describes its process of rubber lining tanks, pipe, fittings, and apparatus used in handling and storing acids and solutions. Applied by the Vulcalock Bonding Process, the rubber lining can be used on equipment now in use as well as on new equipment. A large table lists the resistance characteristics of the rubber lining against attack by chemicals.

Tinning. A miniature four-page folder, issued by All-State Welding Alloys Co., Inc., 249-255 Ferris Ave., White Plains, N. Y., describes a quick, easy way to tin hard-to-tin surfaces, rustproofing metal, and regalvanizing spots where damage has destroyed original surfaces. Designated as the "Kromover" touch-up pencil, it is almost as quick and easy to use as an eraser. Unlike tin plating, it sacrifices itself to protect the iron or steel on which it is applied.

"Packaged" Electric Heaters are the subject of a four-page catalog issued by the Edwin L. Wiegand Co., 7552 Thomas Blvd., Pittsburgh 8, Pa. The catalog discusses packaged immersion, circulation, and other types of heaters that have built-in controls.

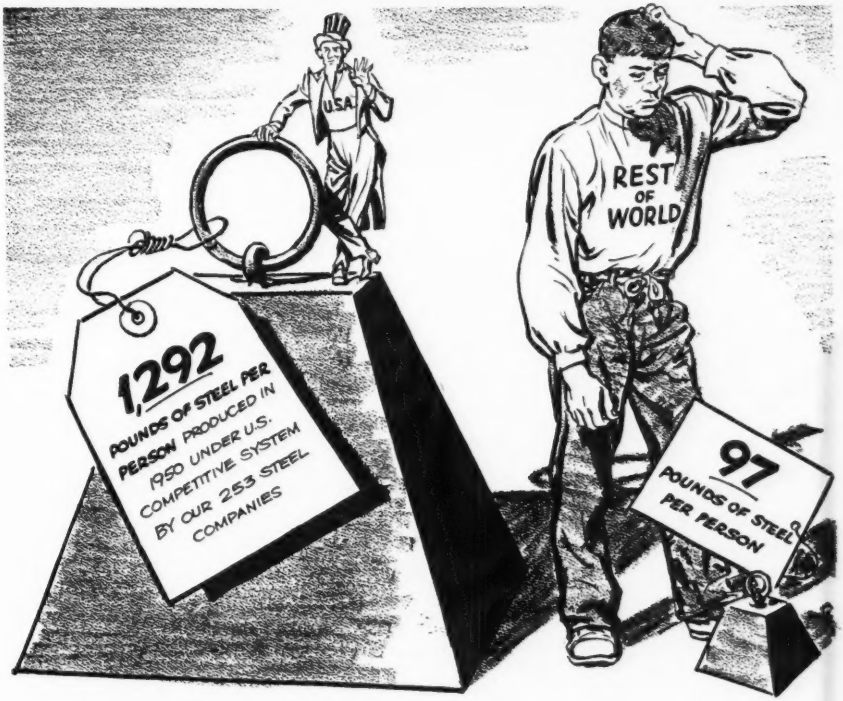
Illustrations point out some of the applications such as maintaining accurate control of plating room temperatures; super-heating steam; melting soft metals; preheating fuel oil and water. Possible installations in various sized and shaped tanks are also pictured.

Film Casting Knife. Henry A. Gardner Laboratory, Inc., 4723 Elm St., Bethesda 14, Md., has released a leaflet which depicts and discusses the Gardner Film Casting Knife.

An instrument of micro-inch accuracy, it is now available commercially for the first time. The leaflet gives a complete description of the knife, its operation, and its features.

DeBothezat Panel Vent Sets. Bulletins containing illustrations, construction details, certified capacity ratings, and dimensions of these fans can be obtained from DeBothezat Fans Div., American Machine and Metals, Inc., East Moline, Illinois.

For further information on any product mentioned in this issue—use the READER SERVICE CARDS between the covers.


USA
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1,292
POUNDS OF STEEL PER PERSON PRODUCED IN 1950 UNDER U.S. COMPETITIVE SYSTEM BY OUR 253 STEEL COMPANIES
97
POUNDS OF STEEL PER PERSON

STEEL makes progress possible—in war or peace...in the manufacture of everything from tableware to tanks, razor blades to skyscrapers, baby carriages to "Big Mo".

How well does competition work in the steel business?

. . . the U.S.A. shows an 83.4% gain in steel output between 1939 and 1950. The rest of the world shows an 0.8% loss.

. . . In 1939, the U.S.A. under "competition" made ⅓ of all the world's steel. Today we produce half—all with only 6% of the people in the world.

. . . Steel workers under "competition" gained in jobs, too. There were 449 thousand jobs in 1939. Today—637 thousand.

The steel industry is just one example of what all of us can expect under a free competitive system. Ours is the security millions of people in the world dream of when they embrace such dead-ends as "planned economies".

Look around and see what happens when people hand their jobs and their factories over to the government. Or have them taken by law. Or by force. Name it what you will—"communism", "nationalization", "socialism", "regimentation"—it is a one-way street and no turning back. By then people no longer own government. Government owns the people.

. . .

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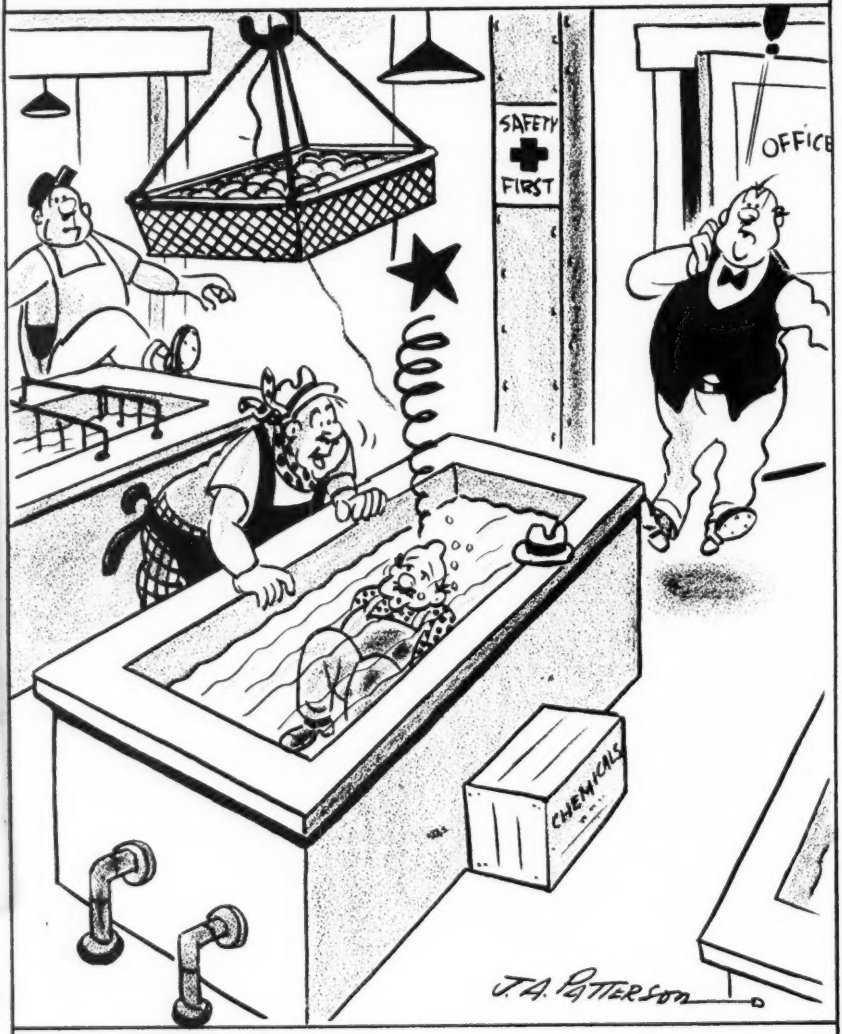
The Finishing Touch **By J. A. Patterson**



"Oh, there you are, Gus---you had me worried for a minute."

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A motion picture titled, **"Listen Herman,"** showing the tremendous market and profit opportunities existing in the appearance reconditioning of automobiles, has been produced by The DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio, and is now ready for showing. This 16 mm. sound film in color runs 25 minutes and 20 seconds. It is available through the company's regional sales offices and its many distributors throughout the country.

With its scenes laid in the office and the paint shop in the service division of an automobile dealer, the film shows the inadequacy of the equipment in the average shop to profitably meet the needs of the day. It emphasizes what is required in the way of properly coordinated equipment to meet the demands for service in a field which should account for as much as 50 per cent of the average shop's service volume, and points out the necessity for the proper training of the spray operator and how this is possible by taking advantage of the training opportunity offered by The DeVilbiss Company. With the installation of the proper equipment, plus properly trained personnel, the film reveals how refinishing and appearance-reconditioning service can be aggressively promoted as well as effectively, efficiently and economically done.

E. F. Frey, director of sales promotion and advertising of DeVilbiss, under whose direction the film was made, points out that while it is basically concerned with auto appearance-reconditioning, the story is presented in such form that many other types of audiences would also benefit from seeing the picture. It is of interest to anyone directly or indirectly concerned in promoting "appearance service" and the safe installation of equipment so graphically shown in "Listen Herman."

The only picture to show aluminum production in full color is **"Pigs and Progress,"** recently revised to bring it up-to-date with the rapidly advancing uses for aluminum and now offered for bookings by the Reynolds Metals Company. It is on 16-millimeter film, in sound and color.

The picture presents in simple language a complete non-technical story of aluminum, the most fascinating of all metals. Beginning with the mining of bauxite in Reynolds own mines, the scenes shift to Reynolds large alumina mill at Hurricane Creek, Arkansas, where the bauxite is converted into alumina, a pure white granular material resembling sugar. The alumina is then shown being electrically reduced at the huge Jones Mills, Arkansas reduction plant to metallic aluminum. Also shown are the mill operations invoved in converting aluminum ingot to such forms as sheet, plate, foil, wire, rod, bar, electric cable, aluminum powders and pastes, rolled and extruded shapes.

In addition to the production of aluminum, the picture reveals how it is fabricated into many consumer items.

Prints of this 26-minute picture on 16-millimeter film with sound track are available for loan without charge. To obtain bookings, write Motion Picture Department, Reynolds Metals Co., 2500 S. Third St., Louisville 1, Kentucky.

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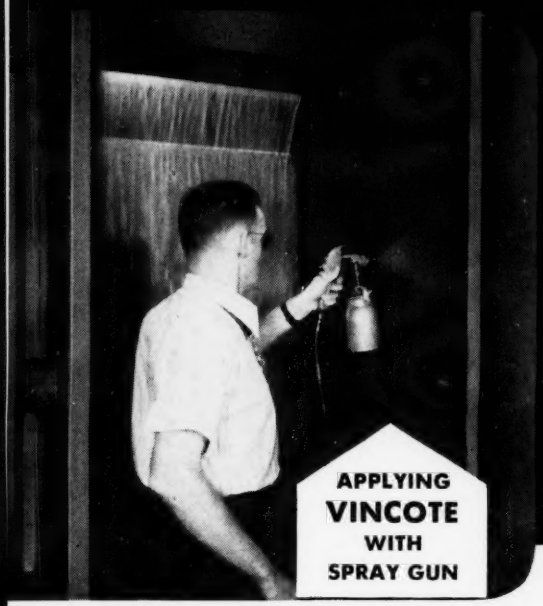

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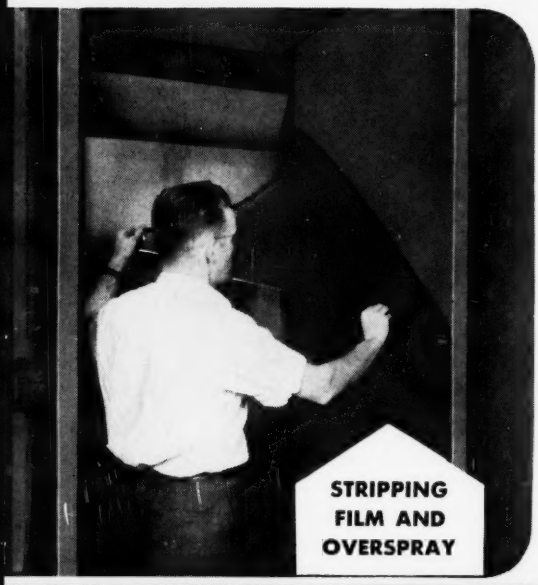

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